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UNITED STATES DEPARTMENT OF AGRICULTURE
BULLETIN No. 963
Contribution from the Office of Farm Management and Farm Economics
H. C. TAYLOR, Chief

In Cooperation with the Bureau of Plant Industry
W. A. TAYLOR, Chief

Washington, D. C. September 21, 1921

COST OF PRODUCING SUGAR BEETS IN UTAH AND IDAHO, 1918-1919

By

L. A. MOORHOUSE, Associate Farm Economist,
Office of Farm Management and Farm Economics

and

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Bureau of Plant Industry

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WASHINGTON
GOVERNMENT PRINTING OFFICE
1921

SUMMARY OF RESULTS

Number of farm records averaged, 220.

Range in cost of sugar beets per ton, $5 to $35.

Two out of the 220 growers produced their beets at the minimum cost, $5 per ton.

The one grower who produced beets at the maximum cost, $35, harvested but 3 tons per acre.

Seventy-three per cent of the growers produced beets at a cost of $11 per ton or less.

Average cost, $9.49 per ton. Costs were above this level on nearly half the farms.

Labor constituted 69 to 75 per cent of all costs exclusive of land rent; material, 7 to 10 per cent; and insurance, taxes, overhead, etc., 17 to 30 per cent.

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INTRODUCTION.

The data in this bulletin are based upon 220 farm estimates given by beet growers in five irrigated districts in Utah and Idaho—namely, Lehi, in Utah County, Utah; Garland, in Boxelder County, Utah; Idaho Falls, in Bonneville County, Idaho; Blackfoot, in Bingham County, Idaho; and Twin Falls, in Twin Falls County, Idaho. (Fig. 1.) The cost estimates obtained in the first four counties are for the year 1918. The records from the Twin Falls area are for 1919.

Special attention is given to a consideration of the basic factors of production. The hours of man labor and horse labor required in growing sugar beets do not vary greatly from year to year, and the pounds of seed used and the tons of manure applied remain fairly constant. Values, however, may fluctuate widely within a relatively short period; hence costs reported on a money basis solely have proved to be very unsatisfactory, especially when comparisons are involved and the results for two different periods are set up side by side. The man-labor and horse-labor requirements are given by operations for each of the four districts. The total average labor requirement is also analyzed by districts.

The farms included in this study derive the major part of their receipts from crop enterprises. Live-stock receipts exceeded 20 per cent of the total farm receipts in one district only. In the Lehi and Garland districts the sugar beet was the outstanding crop enterprise, slightly more than 60 per cent of the total crop receipts coming from this source.

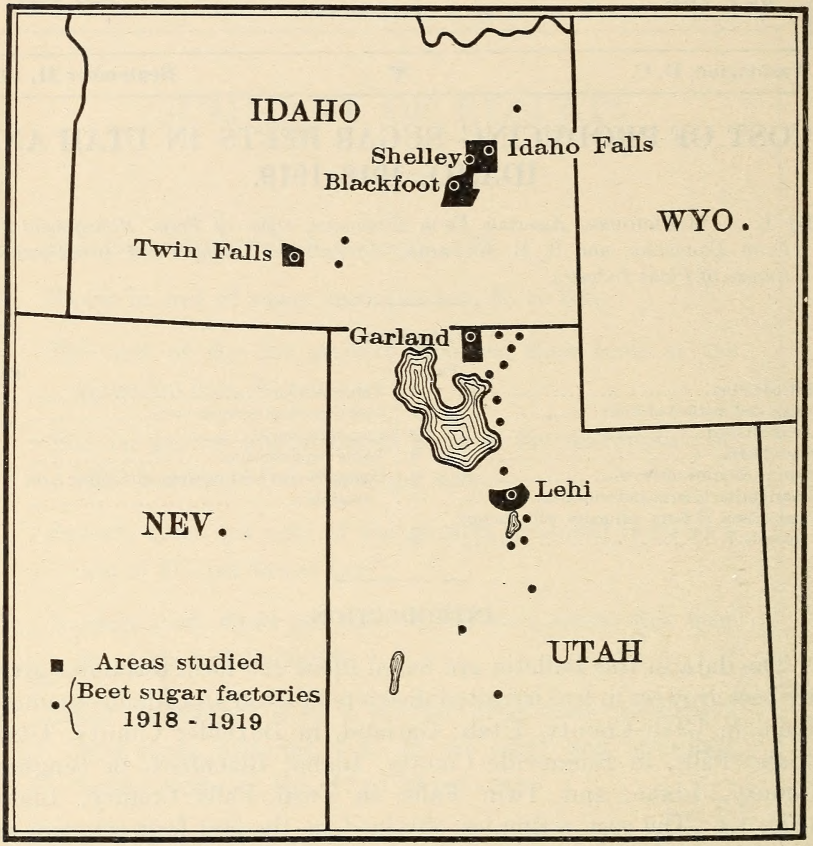

FIG. 1.—Location of areas surveyed.

SCOPE AND METHOD OF STUDY.

This investigation, conducted primarily for the purpose of determining the individual farm costs involved in producing sugar beets during the years 1918 and 1919, is a continuation of work that was done in this field in 1915 and 1916. In planning and developing these studies the Office of Farm Management and Farm Economics has worked in cooperation with the Office of Sugar-Plant Investigations, Bureau of Plant Industry.[1]

In working out the cost figures in this bulletin, man labor was calculated by using an average rate per hour, based upon actual wages paid in 1918 and 1919. To place all records on the same basis, compensation for supervision of the farm business was omitted. The work of each operator was charged against the crop just as if some person had been hired to do each task. Likewise, the horse-labor cost was computed on the basis of the average price paid by farmers for this labor in the respective districts. If it is desired to bring the cost figures down to date, the hours of man labor and horse labor can be multiplied by prevailing rates. Similarly, changes can be made where increases or decreases have occurred in the cost of materials, supplies, rent of land, or other costs.

OBTAINING THE DATA.

The survey method was used. A special schedule was prepared and the blanks were filled out by well-trained enumerators, who visited the beet growers and obtained conservative estimates as to the methods and costs involved in growing the crop of the preceding year. Detailed records were obtained on the size of the crew and the normal time required in performing the various operations. Each grower was questioned systematically with reference to the successive steps that were taken in growing and harvesting the crop. Very few men keep systematic accounts of the daily work performed on each field or in connection with business transactions

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[1] Some preliminary observations were made in these areas during the years 1910, 1911, and 1912. The work at that time dealt almost entirely with farm practice, although some attention was given to certain special problems of farm management. Cultural information was sought with a view to offering suggestions for a few districts where the beet growers were experiencing difficulty in producing satisfactory yields. Subsequently it was felt that data of this character would be of value in planning agronomic experiments which might have a direct bearing upon some of the more urgent problems of the beet grower. The field practice of one district has features which can be adapted with profit in another; and, if enough farms are studied, many general questions with reference to soil and crop management can be answered. The investigation was planned not only for the acquirement of field-practice information with reference to sugar beets, but it was also developed in such a way as to provide basic material concerning the hours of man labor and horse labor, the quantity of seed used, the pounds of fertilizer applied, tons of manure applied, and the utilization of land on farms where the sugar beet constituted one of the most important enterprises.

See the following bulletins: Department Bulletin No. 693, "Farm Practice in Growing Sugar Beets for Three Districts in Utah and Idaho;" Department Bulletin No. 726, "Farm Practice in Growing Sugar Beets for Three Districts in Colorado;" Department Bulletin No. 735, "Farm Practice in Growing Sugar Beets in the Billings Region of Montana;" Department Bulletin No. 748, "Farm Practice in Growing Sugar Beets in Michigan and Ohio;" Department Bulletin No. 760, "Farm Practice in Growing Sugar Beets in Three California Districts;" Farmers' Bulletin No. 1042, "Saving Man Labor in Sugar Beet Fields."

NOTE.—Acknowledgment is due to Messrs. R. S. Washburn and M. R. Cooper, of the Office of Farm Management and Farm Economics, U. S. Department of Agriculture, and to Mr. Byron Hunter, College of Agriculture, Moscow, Idaho, for able assistance in collecting the data which are presented in this bulletins Acknowledgment is also due Miss Catherine R. Hawley, of the Office of Farm Management and Farm Economics, for careful work in supervising the tabulations that were used as a basis for this discussion. Thanks are extended to the farmers of these districts who cooperated in giving detailed estimates with reference to the cost of producing sugar beets.

which are made from time to time; but it has been found that an analysis of a suitable number of farm reports supplies material indicating clearly the trend of affairs in such a group, and that conclusions drawn therefrom can be regarded as significant.

PRESENTING THE DATA.

The first part of this bulletin includes a detailed analysis of the total cost of production. Here the total cost of man and horse labor, the total expense for materials, etc., are combined for the purpose of showing the average district cost of producing an acre or a ton of beets on the farms surveyed. These costs are distributed over the entire beet acreage for these farms. The practice sheets show the actual acreage covered, by operations, and the labor requirements are worked out for the number of acres covered by each implement. When the cost for operations not performed on all farms is charged against the entire beet crop the average is lowered. In determining a regional cost, the entire crop must bear any expense that may apply to a part of the acreage.

The second part describes in some detail the field operations which were employed in producing the 1918 and 1919 beet crops. Each district is treated as a unit and the tables show the percentage of total records and the percentage of total acreage covered in each operation. The most common crew is also given, and the average man and horse requirement for each of these field operations.

While the farm practice studies as a whole are applicable to 220 records, the different methods which are described were not followed on all farms. Plowing, harrowing with spike tooth, leveling, rolling-planting, cultivating, furrowing out and irrigating, blocking, thinning, hoeing, lifting, topping, loading, and hauling are operations common to most farms.

In presenting the farm practice data each district is discussed separately. The results have been compiled in such a way as to show the most common crew and the total average labor requirements for each of the four areas studied. The range in labor requirements is also given.

Tables are also given for the purpose of showing the range in unit cost for the individual farms included in this study. All farms are brought together in Table XIII. The respective districts are treated separately, with respect to range in cost per ton, in Tables XIV to XVII.

AREAS STUDIED.

Four distinct areas were included in this survey. In Utah County an area was selected in the vicinity of Lehi and 44 records were obtained. Utah County has been an important beet-producing center for several years. The manufacture of sugar had its beginning in this State as early as 1852, but this pioneer venture did not prove successful. It remained for the farmers of Utah County to demonstrate at a later date the value of the sugar beet crop. The past 30 years have witnessed the development of an exceedingly important industry for farmers living within the Salt Lake basin and contiguous territory. The previous survey which was made in this county included some 58 enterprise survey reports that were obtained in the vicinity of Provo.

The Garland area is located in the Bear River Valley, in Boxelder County. Cost figures on sugar beets were secured in this district in 1915 and 1916. The present survey included 58 records, which were obtained in the vicinity of Tremonton and Garland. A beet-sugar factory was constructed at Garland in 1903. (Fig. 2.) In the year 1918 Boxelder County led all other counties in Utah in the number of acres planted to sugar beets.

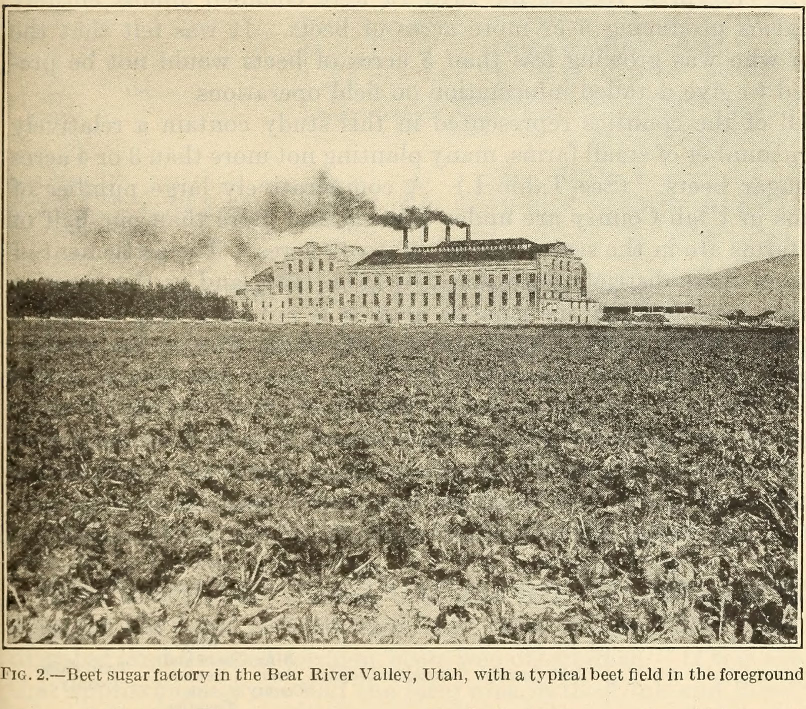

FIG. 2.—Beet sugar factory in the Bear River Valley, Utah, with a typical beet field in the foreground.

The third district was selected in Bonneville and Bingham Counties in Idaho. Thirty-four reports were obtained from farmers near Idaho Falls and 40 from the vicinity of Blackfoot. These two sections are similar in many respects, and may be regarded as one district. A sugar factory was built at Idaho Falls in 1903. A factory was also put up at Blackfoot about the same time. Thus the beginning of the industry in this area corresponds with the initial work in beet production at Garland, Utah.

In the Twin Falls area, 45 cost records were obtained. The area lies in the Snake River Valley and in many respects it is similar to the sections at Idaho Falls and Blackfoot. The beet industry is comparatively new in this section of the State. (For a discussion of the history of the sugar-beet industry in this region, and of climate and soil, see Department Bulletin 693.)

SIZE OF FARM.

The enterprise records for 1918–19 were confined almost entirely to farms producing 5 or more acres of beets. It was felt that the man who was growing less than 5 acres of beets would not be prepared to give detailed information on field operations.

All of the counties represented in this study contain a relatively large number of small farms, many planting not more than 3 or 4 acres to sugar beets. (See Table I.) A comparatively large number of farms in Utah County are under 9 acres; and more than one half of the farms are in the second group, 10 to 49 acres. The settlement of some of these districts dates back to 1846–1850, and as the practice at that time favored the smaller units it is not surprising to find a large number of such tracts at present. Boxelder County has a much larger land area than Utah County and a larger percentage of dry land, which has made necessary the development of many more farms of the larger sizes. The Idaho districts have been developed within more recent years, and although here also there is a tendency in the direction of the smaller units, farms containing a quarter section (160 acres) are much more common than in the Lehi district.

TABLE I.—*Farms grouped by size; all farms in area (1920 census) and farms studied.*

Size of farm.	Utah County.		Boxelder County.		Bingham County.	Bingham and Bonneville[1] Counties.	Twin Falls County.	
	Number of farms in 1919.	Records obtained in 1918.	Number of farms in 1919.	Records obtained in 1918.	Number of farms in 1919.	Records obtained in 1918.	Number of farms in 1919.	Records obtained in 1919.
9 acres and under	428	....	107	....	103	....	181	1
10 to 49 acres	1,674	24	520	29	876	28	817	13
50 to 99 acres	552	12	337	13	1,009	32	859	18
100 to 174 acres	280	7	268	12	775	9	588	11
175 to 259 acres	118	1	160	1	250	3	154	1
260 to 499 acres	100	....	241	2	476	2	119	....
500 to 999 acres	51	....	137	....	112	....	21	....
1,000 acres and over	34	....	89	1	23	....	7	....

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[1] After the 1910 census, Bingham County was divided, and two counties were organized under the names Bingham and Bonneville.

TENURE OF FARMS SURVEYED.

A large percentage of the farms visited were operated by owners. The percentage of owned farms ranged from 74.3 per cent in the Lehi district to 86.8 per cent in the Garland area. (Table II). The second largest group includes tenant farmers who paid a cash rent. The smallest number was in the Garland district; and the largest number in the Lehi. Relatively few farmers rented on a share basis. There was considerable variation in the methods of share renting which were employed on these few farms. The three-quarter share appeared to be the most common.

Table II.—*Distribution of acreage by tenure.*

Region.	Total acres in beets.	Per cent of total beet acreage.						
		Owned.	One-half share.	Two-thirds share.	Three-fourths share.	Three-fifths share.	Four-fifths share.	Cash rent.
Lehi, Utah	303.50	74.3			0.7			25.0
Garland, Utah	766.00	86.8	2.2		2.5			8.5
Idaho Falls and Blackfoot, Idaho	892.30	77.5		1.4	2.0		2.8	16.3
Twin Falls, Idaho	687.03	79.0	2.2	3.0	3.0	1.2		11.6

DISTRIBUTION OF FARM AND CROP AREA.

There are at least three outstanding crops in these four districts—wheat, alfalfa, and sugar beets. A complete farm survey, including some 200 records from the Twin Falls area, indicates that field beans were somewhat more important than sugar beets during the year 1919. Sugar beets can be grown profitably in these areas only on that part of the farm which is supplied with irrigation water. Alfalfa is grown chiefly on irrigated land. The small grains are adapted to the dry-land farms.

In the initial survey made in Utah and Idaho the number of acres irrigated per farm was recorded, and from this the percentage of irrigated land devoted to sugar beets was determined. It was shown that approximately one-half the farm area in the Utah and Boxelder farms was irrigated and 35 to 42 per cent of the land under ditch was devoted to sugar beets. In the Idaho Falls area a much larger percentage of the farm land was classified as under the ditch and the proportion of this area devoted to sugar beets approximated 26 per cent. Estimates were not obtained in the present survey as to the area under irrigation. However, an analysis was made of the distribution of farm area and crop area. (Table III.)

In addition to the three important crops which have been mentioned, it should be noted that some attention is given to the potato in both of the Idaho areas. Oats are grown to some extent in the

Lehi district. A fairly large percentage of the crop acreage at Lehi and in the Garland section was under fallow. There was some fallow land on the irrigated farms. This was due to previous crop failure or to weed eradication. It may be assumed that the remainder of the crops grown on the fallow land were produced under dry farming conditions.

TABLE III.—*Distribution of farm and crop area.*

Items of comparison.	Utah.		Idaho.	
	Lehi.	Garland.	Idaho Falls and Blackfoot.	Twin Falls.
Number of records	44	58	74	44
Total acres per farm	59.33	92.98	79.29	75.33
Per cent of farm in tillable area	73.5	70.3	84.0	92.3
Per cent of farm in crops	69.9	69.2	78.0	84.6
Acres in crops	41.49	64.31	61.84	63.74
Percentage of crop acreage in—				
Alfalfa	21.7	21.1	33.9	21.9
Corn	.9	.5	.6	1.0
Sugar beets	17.1	20.7	21.2	24.5
Potatoes	2.3	.9	8.4	4.4
Hay	6.9	.3	.1	1.6
Wheat	30.9	29.8	26.8	27.0
Oats	7.1	3.9	4.6	2.0
Barley	2.6	1.6	.4	1.7
Fruit and garden	1.1	2.1	2.4	6.9
Fallow land	9.2	18.3	.2	.1
Beans	.1	....	....	5.9
Hay and alfalfa seed	....	....	....	2.8
Miscellaneous	.1	.8	1.4	.2

COMPARISON OF FARM ESTIMATES WITH FACTORY RECORDS.

Each sugar factory keeps a record of the acres planted to sugar beets and the tonnage harvested on each farm. These figures give not only the yield per acre for each farm, but also the average yield for the total acreage harvested. It is therefore possible to check a majority of the growers' estimates on acreage, yield, and receipts for this crop with the actual acreage, yield, and receipts as shown by the factory books. It has been the practice to discard estimates which obviously contained grave mistakes. In this way reliable figures are made available for comparison.[1]

In the former study it was shown that the average estimated acreage per farm in the Garland district was 1.06 greater than the factory record. There was not much difference in the average yield as shown by the two methods in this district, and the cash returns were not far apart. The Utah county area indicated a very striking correspondence in the acreage and cash returns by the two methods, and the difference in yield per acre was insignificant. The Idaho Falls records included considerable variation in the yield per acre, and this was reflected in the income as reported for this crop.

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[1] See Department Bulletin 529, "The Validity of the Survey Method of Research."

VALUE OF LABOR.

Each farmer furnished an estimate of the value of his own labor on the farm, of wages paid out for regular and extra labor, and of the value of horse labor. (Table IV.)

TABLE IV.—*Current rates per hour for labor.*

	Lehi (1918).	Garland (1918).	Idaho Falls and Blackfoot (1918).	Twin Falls (1919).
Man-labor rate	$0.40	$0.45	$0.40	$0.45
Horse-labor rate	.15	.15	.15	.15

There was only a slight difference in the average rate per hour for labor in these four districts. The customary rate for man labor appeared to be 40 to 45 cents per hour, which would mean $4 to $4.50 per 10-hour day. The uniform charge for horse labor was 15 cents per hour, or $3 per day per span of horses. The seasonal variation during the years 1918 and 1919 was small. If studies had been made in the Lehi, Idaho Falls, and Blackfoot areas for the year 1919, the man-labor rate probably would have been somewhat higher, and possibly the horse-labor rate.

The value of both man labor and horse labor has increased perceptibly within the past three or four years. In view of the fact that money values have changed appreciably during that time greater attention should be given to those requirements which show comparatively small variation from year to year.

Since the labor requirements of any crop, except as they are modified by the introduction of new methods, change but little from season to season, if the time required in producing a given crop is recorded in hours the labor cost at any specified time can be determined by applying the rate for that particular period.

In presenting these data, basic requirements, such as hours of man labor, hours of horse labor, tons of manure applied, quantity of seed used, and the systems of tenure under which the land was operated, have been given special emphasis.

COST OF PRODUCING SUGAR BEETS.

The cost figures have been assembled under three headings—labor, materials, and other costs. The compilation includes the total number of acres harvested. These data are therefore applicable to the total beet acreage reported in 44 Lehi, 58 Garland, 74 Idaho Falls, and 44 Twin Falls records. In the Lehi area 303.5 acres of sugar beets were covered. At Garland the harvested acreage amounted to 766, at Idaho Falls 892.3 acres, and at Twin Falls 687 acres. The total cost for each district was based upon these acreages. Dividing the total of all costs in each district by the number of acres grown therein gave the cost per acre for each section. The cost of production of a ton of sugar beets in the respective areas was determined by dividing the total of all costs by the total number of tons marketed. A weighted average is therefore represented in the final result.

LABOR COSTS.

Labor is made up of operators' labor, horse labor, and contract hand labor. By adding these together the total labor cost for each district was determined (Table V.)

TABLE V.—*Labor costs.*

Region.	Year.	Number of farms.	Total acres harvested.	Labor costs per acre.						Range in labor costs.			
										Per acre.		Per ton.	
				Man labor.	Contract hand labor.	Other contract labor.	Horse labor.	Total cost per acre.	Cost per ton.	Average of highest 5.	Average of lowest 5.	Average of highest 5.	Average of lowest 5.
Utah:													
Lehi	1918	44	303.5	$61,88	$8.02	$1.98	$23.65	$95.53	$5.93	$128.75	$67.57	$9.65	$3.92
Garland	1918	58	766	38.82	20.92	3.71	17.95	81.40	5.14	110.45	61.24	8.20	3.65
Idaho:													
Idaho Falls and Blackfoot	1918	74	892.3	30.63	18.12	2.42	14.42	65.59	5.01	100.99	47.73	10.26	3.30
Twin Falls	1919	44	687.03	28.28	27.06	3.78	14.86	73.98	6.78	120.03	55.17	14.60	4.50

COST OF MATERIALS.

Cost of materials includes the value of manure in the yard, money spent for the purchase of manure on a few farms, expense for beet seed, and water assessments. (Table VI.)

TABLE VI.—*Cost of materials.*

District.	Year.	Number of farms.	Total acres harvested.	Cost per acre.				Cost per ton.
				Manure.	Seed.	Water.	Total.	
Lehi, Utah	1918	44	303.5	$9.82	$2.07	$2.09	$13.98	$0.87
Garland, Utah[1]	1918	58	766	5.05	1.96	.92	7.93	.50
Idaho Falls and Blackfoot, Idaho	1918	74	892.3	6.07	1.84	1.10	9.01	.69
Twin Falls, Idaho	1919	44	687.03	3.46	2.29	3.15	8.90	.82

[1] The usual charge for water in the Garland district was $1 per acre. The average cost shown in this table is slightly less than this amount, and it signifies that a few of the operators were renters and the assessments for water were paid by the landlord.

There was considerable difference in the rate of application of manure for the respective districts. The maximum application occurred in the Lehi district. This feature is explained more fully in a discussion concerning the practice of manuring in these areas. The fact that Lehi growers made a very heavy application accounts in a large part for the comparatively high manure charge which is shown in Table VI.

SEED.

The common practice was to plant beet seed at the rate of 15 pounds per acre. The seed was sold to the grower at approximately 15 cents per pound, thus making a uniform rate of $2.25 per acre. Several farmers used less than 15 pounds per acre, and as a result three districts have an acre charge for seed which is somewhat less than $2.25.

WATER ASSESSMENTS.

The farms in the Garland area reported an assessment of approximately $1 per acre for irrigation water. This group, however, contained some rented farms. In such cases the water assessments were not paid by the operator, but were included with the rent. When these farms are included the average cost is lower than $1 per acre.

OTHER COSTS.

"Other costs" are charges which apply to the farm as a whole. They must, therefore, be distributed so that each enterprise will carry its proper proportion of the general expenses. Such items as insurance, taxes, interest on land, land rent, machinery charges, and miscellaneous expense constitute this list. (Table VII.)

TABLE VII.—*Other costs—use of land, taxes, overhead, etc.*

District.	Year.	Number of farms.	Total acres harvested.	Cost per acre.								Cost per ton.
				Use of land.	Taxes and insurance.	Interest on borrowed money.	Machinery.	Roller hire.	Loss due to abandoned acreage.	Overhead.	Total.	
Lehi, Utah	1918	44	303.5	$18.82	$1.92	....	$9.24	$0.20	$0.95	$10.95	$42.08	$2.61
Garland, Utah	1918	58	766	22.77	1.36	$0.04	8.52	.16	.29	8.93	42.07	2.66
Idaho Falls and Blackfoot, Idaho	1918	74	892.3	19.99	1.29	....	8.74	.09	[a]3.24	7.46	40.81	3.12
Twin Falls, Idaho	1919	44	687.03	34.29	3.70	....	7.19	.04	....	8.29	53.51	4.90

[a] In these areas 7.8 per cent of the sugar beet acreage was abandoned.

USE OF LAND.

Every farm owner has a given amount of capital invested in land and a reasonable return is expected annually. In some methods of accounting it is customary to omit the "rent" charge, but in this study allowance is in all cases made for use of land. A large number of farmers in these areas have mortgages on their farms, and they pay a definite rate of interest annually. Clearly this interest is chargeable against the crop grown upon the land. Similarly, interest on investment should be charged against crops grown on land not mortgaged. Since on the farms studied the beet land was given a higher land valuation, sugar beets assumed a greater proportion of the interest cost than the remaining crop enterprises.

Land rent is directly related to interest charges; but it should be borne in mind that the share or cash payment for the rent of land not only covers interest on investment in such land, but also takes care of land taxes, insurance, and assessments for irrigation water.

On farms where the greater part of hand labor is on a contract basis it is the custom for the sugar company to advance the operator sufficient money to pay approximately one-half of the total cost of hand labor as soon as the thinning and hoeing have been completed. The amount of this loan, with interest, is deducted from the beet receipts in the autumn. This interest is a part of the cost of raising beets, and it has been so charged in this study.

INSURANCE AND TAXES.

Figures on farm insurance, taxes, total real-estate investment, and value of the land per acre, were obtained from each operator. From these data the investment in beet land was computed and from this the percentage of the beet-land investment to the total real-estate investment was determined. By applying this percentage to the total farm insurance and taxes the charge against sugar beets was ascertained. This method was employed where the operator owned the land. Where the operator was a renter the insurance and taxes were usually negligible.

MACHINERY.

The annual cost of machinery includes such expenses as repairs, fuels, lubricants, labor of upkeep, depreciation, interest, and insurance, minus credits for machinery hired out. A part of the equipment used in the preparation of beet land is required in caring for other crops, hence the annual machinery charge must be distributed as equitably as possible over the enterprises involved. An arbitrary plan was employed in assigning the machinery charge to the crop enterprises, but in doing this an attempt was made to give each crop its proper weight so that the expense would be distributed proportionately. The machinery charge was fairly uniform throughout all districts. A separate charge of a few cents per acre is included for the hire of rollers by some operators in all of these districts.

OVERHEAD.

There are certain other costs which are not chargeable to any one enterprise in particular, but have to be carried by the farm as a whole, as overhead, a certain share by each enterprise. To make provision for these items a 10 per cent charge was taken on the basis of labor and material costs combined.

SUMMARY OF ALL COSTS.

The distribution of costs has been determined with the charge for land included, and also without a charge for land. These figures are given in Tables VIII and IX.

TABLE VIII.—*Summary and distribution of average costs (including use of land).*

District.	Year.	Cost per acre.	Cost per ton.	Percentage distribution of costs.		
				Labor.	Materials.	Other costs.
Lehi, Utah	1918	$151.59	$9.41	63.0	9.2	27.8
Garland, Utah	1918	131.40	8.29	62.0	6.0	32.0
Idaho Falls and Blackfoot, Idaho	1918	115.41	8.82	56.8	7.8	35.4
Twin Falls, Idaho	1919	136.39	12.50	54.2	6.5	39.3

By comparing Tables VIII and IX it will be seen that at least one significant change is made in the percentage distribution of costs when the charge for the use of land is excluded. The percentage of total cost for labor becomes much more uniform. In fact, the exclusion of interest on land, or land rent, brings the percentage distribution of costs for the three groups on a uniform basis for practically all districts.

TABLE IX.—*Summary and distribution of average costs (excluding use of land).*

District.	Year.	Cost per acre.	Cost per ton.	Percentage distribution of costs.		
				Labor.	Materials.	Other costs.
Lehi, Utah	1918	$132.77	$8.24	72.0	10.5	17.5
Garland, Utah	1918	108.63	6.85	74.9	7.3	17.8
Idaho Falls and Blackfoot, Idaho	1918	95.42	7.29	68.7	9.5	21.8
Twin Falls, Idaho	1919	102.10	9.36	72.5	8.7	18.8

Not counting the use of land, labor constitutes approximately 70 to 75 per cent of the total cost of producing sugar beets in this area. When interest (or rent) is included, the total labor costs vary from 54 to 63 per cent of the total cost.

AVERAGE RETURNS AND MARGIN ABOVE COST.

The highest average yield per acre was reported by the 44 Lehi farms, 16.1 tons for the year 1918. The minimum average yield was reported from the Twin Falls area. However, the Twin Falls area should not be compared directly with the other three regions for the reason that the records for the Twin Falls farms pertain to the crop season 1919. (Table X.)

TABLE X.—*Average returns and margin above cost.*

Region.	Number of farms.	Acres in beets.	Yield per acre.	Received per acre.	Cost per acre.	Net returns per acre.	Total net returns per acre, including tops.	Credit and sales from beet tops.
			Tons.					
Lehi, Utah	44	303.5	16.1	$161.77	$151.59	$10.18	$16.49	$6.31
Garland and Tremonton, Utah	58	766	15.8	158.41	131.40	27.01	31.33	4.32
Idaho Falls and Blackfoot, Idaho	74	892.3	13.1	130.80	115.41	15.39	20.03	4.64
Twin Falls, Idaho	44	687.03	10.9	119.87	136.39	−16.52	−11.51	5.01

It will be seen that net returns from beets varied from $27 per acre as a profit in the Garland area to a loss of $16.52 in the Twin Falls area. By adding the value of tops in each district the margins are increased somewhat for the first three districts and the loss is reduced somewhat for the Twin Falls district. It should be borne in mind that the Twin Falls growers did not sustain an actual cash loss as indicated in the above table, since in addition to interest on investment the crop was charged 45 cents per hour for all labor expended on sugar beets by the operators. Possibly these men would be willing to accept a slightly lower rate than the amount that was used in computing these costs.

PERCENTAGE RETURN ON INVESTMENT AS INFLUENCED BY LAND VALUES.

The results which were obtained on these farms during the years 1918–1919 may be expressed in the form of interest accruing from money invested in the sugar beet business. To say that all farms earned a definite percentage on investment would not be correct, because certain individuals realized a much higher rate, while others fell considerably below this percentage. Furthermore, there was quite a wide range in land values as estimated by these growers. In the Lehi area the lowest estimated land value was $100 per acre, while the highest was $400 per acre; at Garland the range was $150 to $350; in the Idaho Falls district $100 to $350; and in the Twin Falls district, $350 to $800.

What interest did these men earn on the capital invested in the sugar-beet business? This question is answered in part in Table XI, showing cost per acre and percentage return on investment on the basis of different land values.

During the war period the prices of farm products increased and land values went up. However, there was a tendency for the prices of land to lag behind the prices of farm products. So long as farm products commanded good prices, it was possible under average conditions to have sufficient margin after paying for labor and meeting other farm expenses to pay the going interest rate on the land investment. It will be admitted that the values which obtained under war conditions were in part speculative values. In a period of declining prices for farm products, adjustments have to be made in the farm business. One adjustment that should receive early consideration has to do with land valuation. Success in the arrangement of the farm will depend in part upon the earnings that accrue and are available to pay for capital. If the land is overvalued, the rate may be exceedingly low.

TABLE XI.—*Cost of sugar beets per acre (excluding use of land) and percentage return on investment as influenced by land values.*

Region.	Year.	Number of farms.	Yield per acre.	Total cost per acre.	Return per acre.[1]	Margin per acre.	Percentage return on investment with land at—					Average land value as reported.
							$200	$300	$400	$500	$600	
Utah:			Tons.									
Lehi	1918	44	16.1	$132.77	$168.08	$35.31	17.7	11.8	8.8	7.1	5.9	$215
Garland	1918	58	15.8	108.63	162.73	54.10	27.0	18.0	13.5	10.8	9.0	259
Idaho:												
Idaho Falls and Blackfoot	1918	74	13.1	95.42	135.44	40.02	20.0	13.3	10.0	8.0	6.7	228
Twin Falls	1919	44	10.9	102.10	124.88	22.78	11.4	7.6	5.7	4.6	3.8	442

[1] Including beets and beet tops.

If the different values as given by these farmers are applied, it will be seen that there was quite a wide range in the returns on investment. Relatively good yields were reported in the three districts surveyed in 1918, while in the fourth district, surveyed in 1919, the crop was rather poor. This fact should not be overlooked in making a comparison of results. With the unfavorable conditions that obtained at Twin Falls and the comparatively high land values shown in these estimates, it was not possible to earn a high interest rate.

A study of results through a series of years in all of these districts would doubtless be of great value. From the standpoint of farm organization it is highly desirable to compare one enterprise with another, using the interest earned on investment as a basis for judging results.

VALUE OF TOPS.

More attention is being given from year to year to the utilization of beet tops. The high price of hay in the intermountain region within the past two years has compelled farmers in this area to conserve the supplies of roughage on the farm. Beet tops have therefore been saved and have been fed more carefully within recent years than formerly. Certain methods of handling beet tops entail considerable waste under present systems of management. On some of these farms the beet tops were sold to men who had cattle or sheep to feed. This provided a cash return to the farmer and was considered in the present analysis. (Table X.)

BEET ACREAGE PER FARM AND PER ACRE IN RELATION TO COST.

As has already been pointed out, yield per acre is an important factor when making a study of crop costs. The number of acres planted per farm also appears to exert influence on cost of production. (Table XII.)

Increasing the yield per acre made the total cost per acre greater, but each successive increase in yield reduced the cost per ton. It would seem that the grower who is producing from 15 to 18 tons per acre,either in small, medium, or comparatively large tracts, can grow and market these beets at a much lower cost per ton than the man who gets 12 tons or less per acre under similar conditions. With greater efficiency in handling a few of the major operations, higher yields would undoubtedly result, and this in turn would appreciably increase the margin above cost. In Table XII there are at least two groups too small to be safely used as a basis for conclusions, but the general trend of the farm in the respective groups indicates that yield per acre is an important factor and that the farms with the larger acreages in sugar beets produced the crop more economically than the smaller farms.

TABLE XII.—*Acres in beets and yield per acre as influencing cost of production.*

Acres in sugar beets.	Yield 12 tons or less per acre.			Yield 12 to 15 tons.			Yield 15 to 18 tons.			Yield over 18 tons.		
	Number of farms.	Cost per acre.	Cost per ton.	Number of farms.	Cost per acre.	Cost per ton.	Number of farms.	Cost per acre.	Cost per ton.	Number of farms.	Cost per acre.	Cost per ton.
Under 10	42	$124.24	$13.99	27	$147.45	$10.45	28	$142.73	$8.59	24	$162.81	$7.45
10 to 15	24	110.11	12.29	11	134.95	9.45	15	132.13	8.01	7	136.54	6.73
15 and over	13	121.95	13.69	14	122.63	8.65	14	132.42	7.98	1	127.55	6.54

RANGE IN COST PER TON.

The accompanying frequency chart (fig. 3) shows the distribution of farm operators in these four districts on the basis of cost per ton in producing sugar beets. In this study the records for the two crop years 1918–19 have been combined. There were two growers in these areas who produced sugar beets at a cost of $5 per ton. These men obtained an average yield of 24 tons per acre. The maximum unit cost for an individual farm was $35 per ton, incurred by an operator who had a yield of but 3 tons per acre. Another individual had a cost of $34 per ton. Here the yield was approximately 7 tons per acre harvested, but a part of the planted acreage was abandoned.

Comparatively low yields explain many of the other high costs which are shown in the frequency tables. (Tables XIII to XVII.)

Seventy-two per cent of these growers produced sugar beets at a cost of $11 per ton or less. The cost groups $5 to $11, inclusive, had 75.9 per cent of the harvested acreage and 85 per cent of the total production of the farms represented in this study. The average yield for the 23 farms producing at a cost of $11 per ton was 12.3 tons per acre. Essentially 80 per cent of the operators, 81 per cent of the harvested acreage, and 89 per cent of the total production are covered by a cost of $12 per ton or less.

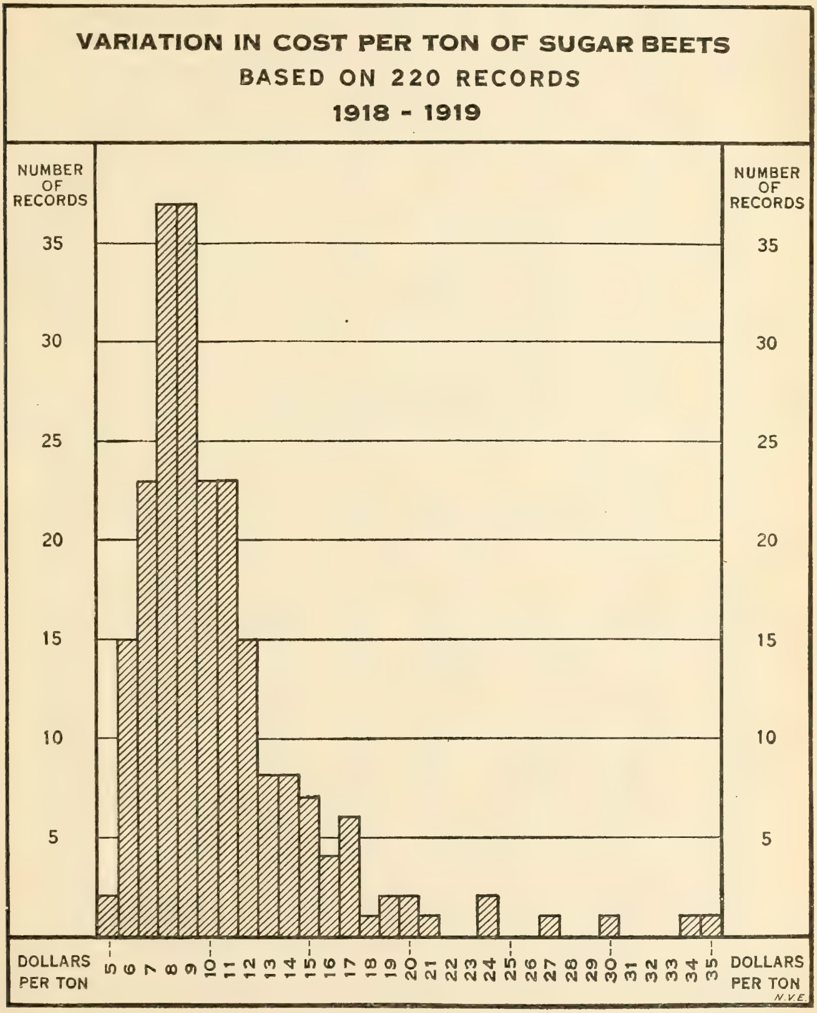

FIG. 3.—Frequency chart, showing range in cost per ton.

IMPORTANCE OF YIELD.

On practically every farm there are opportunities to place the field work upon a more efficient basis. Every operator is willing to concede that some slight change in present methods would undoubtedly be a step in the direction of greater crop yields. It has been pointed out that the sugar beet is not always grown in the regular cropping system. Continuous culture may therefore be preventing the grower from getting maximum results. In other cases a lack of fertility may be the limiting factor, although in all four districts nearly every grower gave considerable attention to the application of farm manure. Inadequate preparation of soil or careless seeding may give a poor stand, which makes a good yield impossible, or the blocking and thinning may be done in such a way as to interfere seriously with the stand. These are factors which should be kept in mind throughout the season, and if weak places are found in the present methods of operation and management they should be corrected as far as possible.

TABLE XIII.—*Variation in cost per ton—summary, Utah and Idaho sugar beet districts, 1918 and 1919 (220 records).*

Cost per ton.	Number of records.	Cumulative percentage of records.	Acres.		Cumulative percentage of harvested acreage.	Production.	Cumulative production.	Cumulative percentage of production.
			Seeded.	Harvested.				
						Tons.	*Tons.*	
$5.00	2	0.9	15	15	0.6	365	365	1.0
6.00	15	7.7	171.3	171.3	7.1	3,328.5	3,693.50	10.2
7.00	23	18.1	291.5	287.5	17.9	4,790.78	8,484.28	23.4
8.00	37	34.9	486.5	478.5	36.0	7,831.3	16,315.58	45.0
9.00	37	51.7	536	536	56.2	7,861.8	24,177.38	66.7
10.00	23	62.1	290.75	275.25	66.6	3,619.3	27,796.68	76.7
11.00	23	72.6	253	247	75.9	3,026	30,822.68	85.1
12.00	15	79.4	134.2	134.2	81.0	1,410.9	32,233.58	89.0
13.00	8	83.0	85.33	79.33	84.0	746.7	32,980.28	91.1
14.00	8	86.6	69	69	86.6	592.2	33,572.48	92.7
15.00	7	89.8	59.5	58.5	88.8	488.3	34,060.78	94.1
16.00	4	91.6	38.25	35.25	90.1	293	34,353.78	94.9
17.00	6	94.3	91	63.5	92.5	566.75	34,920.53	96.5
18.00	1	94.8	5	5	92.7	71.75	34,992.28	96.7
19.00	2	95.7	52.75	52.75	94.7	300.7	35,292.98	97.5
20.00	2	96.6	17	13	95.2	77	35,369.98	97.7
21.00	1	97.1	85	85	98.4	595	35,964.98	99.3
22.00	......	......	......	......	......	......	......	......
23.00	......	......	......	......	......	......	......	......
24.00	2	98.0	13.75	13.75	98.9	78	36,042.98	99.5
25.00	......	......	......	......	......	......	......	......
26.00	......	......	......	......	......	......	......	......
27.00	1	98.5	15	15	99.5	67.5	36,110.48	99.7
28.00	......	......	......	......	......	......	......	......
29.00	......	......	......	......	......	......	......	......
30.00	1	99.0	5	5	99.7	30	36,140.48	99.8
31.00	......	......	......	......	......	......	......	......
32.00	......	......	......	......	......	......	......	......
33.00	......	......	......	......	......	......	......	......
34.00	1	99.5	20	5	99.9	35	36,175.48	99.9
35.00	1	100.0	4	4	100.0	12	36,187.48	100.0

Average cost per ton, $9.49. Average yield per acre, 13.7 tons.

RANGE IN ACRE COSTS.

The accompanying range tables are devoted exclusively to variations in unit cost per ton. It is of interest also to compare the individuals which are included in this study from the standpoint of acre costs. These figures are given in Table XVIII.

TABLE XIV.—*Variation in cost per ton—Lehi, Utah (1918).*

Cost per ton.	Number of records.	Cumulative percent. age of records.	Acres.		Cumulative percentage of harvested area.	Production.	Cumulative production.	Cumulative percentage of production.
			Seeded.	Harvested.				
						Tons.	*Tons.*	
$5.00	1	2.3	5	5	1.6	135	135	2.8
6.00	1	4.6	6	6	3.6	130	265	5.5
7.00	4	13.7	29	29	13.2	615	880	18.0
8.00	7	29.6	48.5	48.5	29.1	942.1	1,822.1	37.4
9.00	7	45.5	51.5	51.5	46.1	902	2,724.1	55.8
10.00	9	65.9	81	77	71.6	1,051	3,775.1	77.4
11.00	6	79.5	28	28	80.9	432	4,207.1	86.1
12.00	4	88.6	30	30	90.7	364	4,571.1	93.5
13.00	1	90.9	4	4	92.0	60	4,631.1	94.7
14.00	1	93.2	9	9	95.0	117	4,748.1	97.1
15.00	2	97.7	12.5	11.5	98.7	108.5	4,856.6	99.3
16.00	......	97.7	....	....	98.7	....	....	99.3
17.00	......	97.7	....	....	98.7	....	....	99.3
18.00	......	97.7	....	....	98.7	....	....	99.3
19.00	......	97.7	....	....	98.7	....	....	99.3
20.00	1	100.0	8	4	100.0	32	4,888.6	100.0

Average cost per ton, $9.41. Average yield per acre, 16.1 tons.

NOTE.—Approximately 80 per cent of the operators in this district produced sugar beets at a cost of $11 per ton or less. The unit costs for the groups, $5 to $11, inclusive, embraced 81 per cent of the harvested acreage and 86 per cent of the total production. The farm having the lowest unit cost in this district secured a yield of 27 tons per acre, whereas the farm reporting the highest unit cost at a yield of 8 tons per acre. It should also be noted that in the latter case only 50 per cent of the seeded acreage was harvested.

TABLE XV.—*Variation in cost per ton—Garland, Utah (1918).*

Cost per ton.	Number of records.	Cumulative percentage of records.	Acres.		Cumulative percentage of harvested acreage.	Production.	Cumulative production.	Cumulative percentage of production.
			Seeded.	Harvested.				
						Tons.	*Tons.*	
$5.00	1	1.7	10	10	1.3	230	230	1.9
6.00	7	13.8	49.5	49.5	7.8	1,031.7	1,261.7	10.4
7.00	9	29.4	109	109	22.0	1,915.5	3,177.2	26.2
8.00	18	60.4	303	299	60.9	4,866.5	8,043.7	66.4
9.00	10	77.6	159	159	81.7	2,309.5	10,353.2	85.4
10.00	4	84.5	37	37	86.6	598	10,951.2	90.3
11.00	7	96.6	88.5	86.5	97.9	1,070	12,021.2	99.1
12.00	......	96.6	....	....	97.9	....	....	99.1
13.00	......	96.6	....	....	97.9	....	....	99.1
14.00	1	98.3	9	9	99.1	64	12,085.2	99.6
15.00	......	98.3	....	....	99.1	....	....	99.6
16.00	......	98.3	....	....	99.1	....	....	99.6
17.00	1	100.0	7	7	100.0	49	12,134.2	100.0

Average cost per ton, $8.29. Average yield per acre, 15.8 tons.

NOTE.—The lowest unit cost in this area was $5 per ton, and the operator who obtained this result had a yield of 23 tons per acre. The highest unit cost was $17 per ton on a farm having a yield of 7 tons per acre. The groups in this district which had costs ranging from $5 to $9 per ton included approximately 78 per cent of the operators, 82 per cent of the harvested acreage, and 85 per cent of the total production.

The lowest cost per acre was $75.48 and the highest was $253.66. The largest single group, having 81 farms, reported acre costs of from $125 to $150, while the second largest group, with 70 farms, had acre costs of from $100 to $125. These two groups taken together constitute approximately 69 per cent of the total number of farms visited,

TABLE XVI.—*Variation in cost per ton—Idaho Falls and Blackfoot (1918).*

Cost per ton.	Number of records.	Cumulative percentage of records.	Acres.		Cumulative percentage of harvested acreage.	Production.	Cumulative production.	Cumulative percentage of production.
			Seeded.	Harvested.				
						Tons.	*Tons.*	
$6.00	7	9.5	115.8	115.8	13.0	2,166.80	2,166.80	18.6
7.00	10	23.0	153.5	149.5	29.8	2,260.28	4,427.08	38.0
8.00	12	39.2	135	131	44.5	2,022.70	6,449.78	55.3
9.00	12	55.4	145	145	60.8	1,906.50	8,356.28	71.7
10.00	8	66.2	130.5	119	74.1	1,290.80	9,647.08	82.8
11.00	7	75.7	80.5	76.5	82.7	808	10,455.08	89.7
12.00	3	79.8	25	25	85.5	254.50	10,709.58	91.9
13.00	3	83.9	31	25	88.3	236	10,945.58	93.9
14.00	2	86.6	20	20	90.5	154.20	11,099.78	95.2
15.00	3	90.7	26	26	93.4	178	11,277.78	96.7
16.00	1	92.0	12	9	94.4	63	11,340.78	97.2
17.00	3	96.1	51	23.5	97.0	187.75	11,528.53	98.8
18.00	......	....	....	....	....	....	....	....
19.00	1	97.4	13	13	98.4	63	11,591.53	99.3
20.00	1	98.7	9	9	99.4	45	11,636.53	99.7
34.00	1	100.0	20	5	100.0	35	11,671.53	100.0

Average cost per ton, $8.82. Average yield per acre, 13.1 tons.

NOTE.—There was a wide variation in the unit costs reported for the 74 farms in this district. The minimum cost per ton was $6, while the maximum was $34. The seven farms with the minimum unit cost produced an average yield of 18.7 tons per acre. The farm operator with the high unit cost had a yield of 7 tons per acre. The unit cost on the latter farm was accentuated owing to the abandonment of three-fourths of the planted acreage. The groups with unit costs ranging from $6 to $11, inclusive, embraced 76 per cent of these growers, 83 per cent of the harvested acreage, and 90 per cent of the total production.

TABLE XVII.—*Variation in cost per ton—Twin Falls, Idaho (1919).*

Cost per ton.	Number of records.	Cumulative percentage of records.	Acres.		Cumulative percentage of harvested acreage.	Production.	Cumulative production.	Cumulative percentage of production.
			Seeded.	Harvested.				
						Tons.	*Tons.*	
$9.00	8	18.2	180.50	180.50	26.3	2,743.8	2,743.8	36.6
10.00	2	22.7	42.25	42.25	32.4	679.5	3,423.3	45.7
11.00	3	29.5	56	56	40.6	716	4,139.3	55.3
12.00	8	47.7	79.20	79.20	52.1	792.4	4,931.7	65.9
13.00	4	56.8	50.33	50.33	59.4	450.7	5,382.4	71.9
14.00	4	65.9	31	31	63.9	257	5,639.4	75.3
15.00	2	70.4	21	21	67.0	201.8	5,841.2	78.0
16.00	3	77.2	26.25	26.25	70.8	230	6,071.2	81.1
17.00	2	81.7	33	33	75.6	330	6,401.2	85.5
18.00	1	84.0	5	5	76.3	71.75	6,472.95	86.5
19.00	1	86.3	39.75	39.75	82.1	237.7	6,710.65	89.7
20.00	......	....	....	....	....	....	....	....
21.00	1	88.6	85	85	94.5	595	7,305.65	97.6
22.00	......	....	....	....	....	....	....	....
23.00	......	....	....	....	....	....	....	....
24.00	2	93.1	13.75	13.75	96.5	78	7,383.65	98.6
25.00	......	....	....	....	....	....	....	....
26.00	......	....	....	....	....	....	....	....
27.00	1	95.4	15	15	98.7	67.5	7,451.15	99.5
28.00	......	....	....	....	....	....	....	....
29.00	......	....	....	....	....	....	....	....
30.00	1	97.7	5	5	99.4	30	7,481.15	99.9
31.00	......	....	....	....	....	....	....	....
32.00	......	....	....	....	....	....	....	....
33.00	......	....	....	....	....	....	....	....
34.00	......	....	....	....	....	....	....	....
35.00	1	100.0	4	4	100.0	12	7,493.15	100.0

Average cost per ton, $12.50. Average yield per acre, 10.9 tons.

NOTE.—Attention has been directed to the fact that average farm operators in this group lost money on the 1919 crop of beets. It should be remembered that these men were allowed 45 cents per hour for their labor and the current rate of interest for the money invested in their business. The minimum unit cost was $9 per ton and the maximum $35 per ton. The average yield for the eight low cost farms was 15.2 tons per acre, whereas the farm having the highest unit cost produced only 3 tons per acre. There were six farms on which the unit costs exceeded $20 per ton. The yields on these farms ranged from 3 to 7 tons per acre.

and indicate a range in acre costs from $100 to $150. It will be noted that as the cost per acre increases the yield per acre also advances. Between the 18 farms in group one and the 21 farms in group five there is a difference of 8.2 tons per acre. Apparently the point of diminishing returns was not reached on these farms.

TABLE XVIII.—*Variation in the cost per acre—all districts (1918–1919).*

Cost per acre.	Number of farms.	Cumulative percentage of number of farms.	Acres.		Cumulative percentage of harvested acreage.	Yield.	Cumulative yield.	Cumulative percentage of yield.	Yield per acre.
			Seeded.	Harvested.					
						Tons.	*Tons.*		*Tons.*
$100 and under	18	8.2	213.5	213.5	8.1	2,036.6	2,036.6	5.6	9.5
$100 to $125	70	40.0	1,011.05	991.05	45.5	12,252.3	14,288.9	39.5	12.4
$125 to $150	81	76.8	1,076.53	1,031.53	84.4	15,120.83	29,409.73	81.3	14.7
$150 to $175	30	90.4	290.25	280.25	95.0	4,427.50	33,837.23	93.5	15.8
Over $175	21	100.0	147.50	132.50	100.0	2,350.25	36,187.48	100.0	17.7

CROP ROTATION.

Within recent years the question of introducing systematic cropping on the farms of this general region has been given some attention. While it is true that there are some farms in each area where individual crops are grown continuously upon the same land, the value of a good rotation is conceded by progressive farmers. However, it is apparent that good working systems have been adopted on relatively few farms. Some farmers are limited by the number of crops which may be grown under their individual conditions. Some farms contain dry land as well as irrigated land. The dry land is of necessity devoted to the production of grain exclusively, whereas the irrigated land is set aside for alfalfa, sugar beets, and truck, fruit, or garden crops. It will be seen that this arrangement makes it impossible for some of these men to use grain at regular intervals in rotation with sugar beets. Each crop has its adaptations, and these characteristics must be taken into account in laying out a cropping system. With this situation facing the grower, there is a natural tendency to allow sugar beets to follow sugar beets on the same field for several years. The location of the field with reference to beet dumps and roads often has much to do with its selection for sugar beets.

The survey schedule contained two questions which were used for the purpose of determining the crop or crops which preceded sugar beets; also the crop or crops which were or would be planted after sugar beets. A summary of this analysis is given in Table XIX.

In the Lehi district nearly 60 per cent of the best acreage represented on the farms included in this survey was planted on land which had produced a crop of beets the preceding year. Sugar beets followed the 1918 crop on essentially 56 per cent of the Lehi acreage upon which these cost figures are based. About one-third of the beet crop was grown after grain in both the Lehi and Twin Falls districts. The Garland and Idaho Falls growers reported that sugar beets followed beets on 84 per cent and 71 per cent, respectively, during the year 1918. Continuous culture was employed to a somewhat greater extent in 1919.

TABLE XIX.—*Occurrence of sugar beets in cropping system.*

PERCENTAGE OF TOTAL SUGAR BEET ACRES FOLLOWING CROPS SPECIFIED.

Region.	Beets.	Potatoes.	Alfalfa.	Pasture.	Grain.	Miscellaneous.	Total.
Lehi, Utah	57.2	10.7	0.4	....	28.6	3.1	100.0
Garland and Tremonton, Utah	83.8	.8	8.1	....	7.3	....	100.0
Idaho Falls and Blackfoot, Idaho	71.3	22.5	2.3	0.7	2.8	.4	100.0
Twin Falls, Idaho	31.2	9.8	22.0	....	33.6	3.4	100.0
PERCENTAGE OF TOTAL SUGAR BEET ACRES FOLLOWED BY CROPS SPECIFIED.							
Lehi, Utah	55.9	1.1	....	....	43.0	....	100.0
Garland and Tremonton, Utah	96.1	....	1.1	....	2.8	....	100.0
Idaho Falls and Blackfoot, Idaho	78.6	8.9	....	....	12.5	....	100.0
Twin Falls, Idaho	52.2	....	....	....	47.8	....	100.0

Both the enterprise survey which was carried out in these districts in 1915 and 1916 and the present survey appear to indicate that quite a large number of growers favor the production of sugar beets on the same piece of land for several years in succession. This practice is no doubt due in part to the prevailing opinion that beet land improves with cultivation. Many growers contend that they are getting better yields now in fields that have produced five or more crops than they were able to obtain during the first two or three years of their experience. It is not unusual to find beets upon the same field for eight to twelve years without the introduction of any other crop. Such a system invariably invites trouble and eventually brings a shortage in yield through the development of plant diseases or the multiplication of insect pests. A few men have recognized the serious possibilities of such a condition and are endeavoring to modify this method of cropping. (Figs. 4 and 5.)

LABOR REQUIREMENTS.

Growing sugar beets involves two classes of labor—that furnished by the farmer and his teams, and contract hand labor. Since it is a general practice to hire certain operations done at a stipulated price per acre or per ton, it is customary to report the contract labor in money values. There were several farms in each of these districts, however, on which the hand labor was performed by the operator and his family. In these instances estimates were obtained with reference to the number of hours required in doing the blocking and thinning, hoeing, pulling, and topping. This phase is discussed in part under the heading "Hand labor on sugar beets."

To determine the total requirements for this crop, including hand labor, the records giving estimates on hand labor alone have been used. Table XX gives the labor in producing an acre of sugar beets. A separation has been made in this table for the purpose of showing the acre requirement, excluding hand labor. The 10 farms having the highest man-labor requirement in each district have been averaged and the result is given for comparison. Also, the 10 farms having the lowest man-labor requirement in each district have been set up.

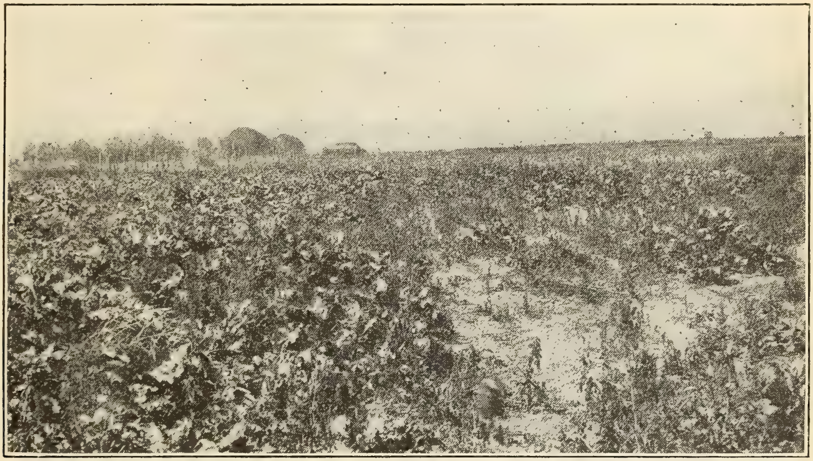

FIG. 4.—Sugar beets have been grown for several years on this field. Result: Poor stand, diseased condition, low yield, and high cost per ton.

TABLE XX.—*Total labor requirement per acre.*

Region.	Number of records.	Acres harvested.	Hours per acre.		Hours per acre, excluding hand labor.[1]					
					Average.		Average of highest 10.		Average of lowest 10.	
			Man.	Horse.	Man.	Horse.	Man.	Horse.	Man.	Horse.
Lehi, Utah	44	303.5	181	163	83	163	110	212	61	122
Garland, Utah	58	766	129	136	56	136	81	175	45	118
Idaho Falls and Blackfoot, Idaho	74	892.3	119	105	52	105	81	147	37	83
Twin Falls, Idaho	44	687.03	133	110	56	110	78	129	44	94

[1] Hand labor includes blocking and thinning, hoeing, and topping.

In general, the total man-labor requirement is approximately the same in this investigation as the total requirement given in 1915–16. In the former study Garland operators reported a total of 133.3 man-hours per acre, whereas in this study the total requirement is given as 129 hours per acre. In the Idaho Falls area the total man-labor requirement for the initial study was 119.4 hours per acre, whereas in this study it is given as 119 hours. In the Provo area, which can be compared with the Lehi district, the total man-labor requirement was 130.8 hours per acre in 1915–16, whereas in this investigation the total for the Lehi district was 181 hours per acre. It may be stated that the high labor requirement for manuring sugar beets in the Lehi area made the total requirement comparatively high. The average yield in the Provo area was essentially 15 tons in 1915–16, whereas in the Lehi district a yield of 16.1 tons was obtained in 1918. This difference would not appreciably change the labor requirements.

FIG. 5.—Sugar beets grown in rotation, and receiving applications of farm manure at regular intervals. Result: Good stand, healthy condition, high yield, and low cost per ton.

The horse-labor requirements were somewhat lower in 1914–15 than in the current survey. These increases for the respective districts are distributed quite uniformly over the preparatory operations, such as plowing, leveling, harrowing, etc. Evidently somewhat more time was necessary to bring the soil into suitable condition than in the former years.

LABOR REQUIREMENTS, BY OPERATIONS.

In compiling the tables which include the normal time for each field operation the average crew size has been used. This item requires a brief explanation. When all farms within a given district are brought together, crews of various sizes will be found within the group. The degree of variation will depend largely upon the type of operation. Cultivating will not include more than two crews as a rule. These will usually consist of one man and one horse and one man and two horses. Such operations as plowing, harrowing, and leveling may involve several crew sizes. In computing averages for these different groups, fractions appear in the horse column. The prevalence of certain crew sizes always exerts considerable influence upon the average which is obtained. In these tables the most common crew sizes found in each district, as well as the average sizes, are shown. (Tables XXI to XXIV.)

PREPARATORY WORK.

The preparation of the seed bed for any crop grown under irrigation frequently calls for special work to insure a uniform distribution of water when the proper season arrives. An uneven surface interferes with the run of water and prevents a portion of the field from receiving the amount which is required by the crop to produce the usual yield. It is the custom in all of these districts to level the cultivated area with a scraper of one type or another. Ordinarily a few days are spent during the fall and winter months with the team and scraper at this particular task. (Fig. 6.) In this study scraping the land has been considered improvement work, and while a small amount of man and horse labor was shown on some of these records no charge for this operation was made against the beet crop. It was agreed that this expense should be distributed through a series of years and this process renders the cost for a single crop season practically negligible. Such work merely adds to the farm capitalization, and any costs that may accrue will be taken care of in the distribution of general farm expense to the several enterprises of the business.

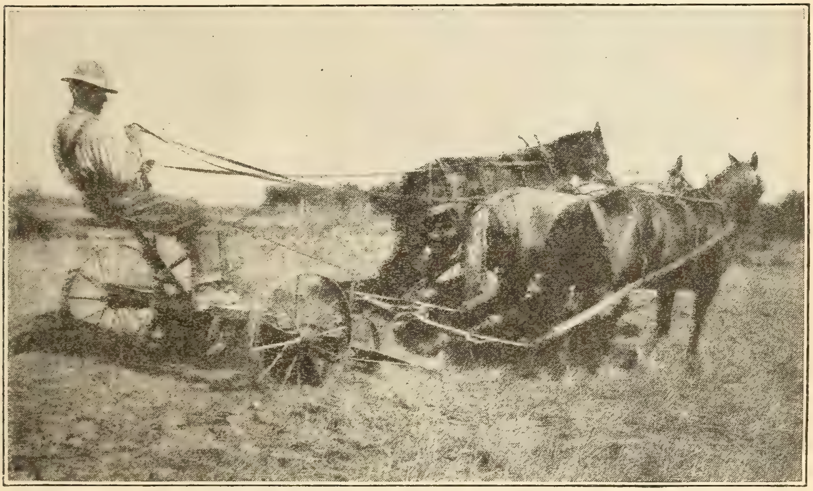

FIG. 6.—Scraping land with a riding fresno.

TABLE XXI.—*Normal time, by operations, in producing sugar beets—Lehi district, Utah (1918).*

Operation.	Per cent age of total records.	Total acres covered.	Per centage of total acreage covered.	Average crew.		Most common crew.		Rate per day.	Times over.	Average hours per acre.	
				Man.	Horse.	Man.	Horse.			Man.	Horse.
Manure	93	204.5	65	1.1	2.0	1	2	4.7 loads	......	34.7	68.9
Plow	100	312.5	100	1.0	3.1	1	3	1.6 acres	1	6.6	20.1
Harrow (spike)	100	312.5	100	1.0	2.9	1	3	9.8 acres	3.5	3.6	10.6
Level	100	312.5	100	1.0	3.1	1	3	7.6 acres	2.2	2.9	8.7
Harrow (spring)	41	142	45	1.0	3.1	1	3	4.7 acres	1.4	2.9	9.0
Roll before plant	2	3.5	1	1.0	2.0	1	2	10 acres	1.0	1.1	2.2
Disk (one-half lap)	7	15.5	5	1.0	3.3	1	3	1.9 acres	1.0	3.0	9.3
Plant	100	312.5	[a] 100	......	......	......	......	......	......	......	......
Roll after plant	75	240.5	77	1.0	2.0	1	2	11.4 acres	1.0	.8	1.6
Cultivate	100	303.5	97	1.0	1.1	1	1	4.9 acres	4.8	9.5	10.2
Ditch	59	198	63	1.1	2.0	1	2	......	1.0	.6	1.1
Ditch (man only)	98	307.5	98	1.0	......	1	......	2.9 acres	1.1	3.5	......
Furrow	100	303.5	97	1.0	1.1	1	1	5.7 acres	1.9	3.3	3.5
Irrigate	100	303.5	97	1.0	......	......	......	5.1 acres	5.9	12.3	......
Block and thin	100	[b]304.5	100	1.0	......	......	......	.29 acres	1.0	36.4	......
Hoe	100	303.5	100	1.0	......	......	......	.8 acres 1.0 acres .9 acres	2.2	27.4	......
Pull weeds	20	45.5	15	1.0	......	......	......	1.4 acres	1.1	9.1	......
Lift	100	303.5	100	1.0	2.8	1	3	1.4 acres	1.0	6.5	17.9
Top and load	100	303.5	100	1.2	......	......	......	5.7 tons	1.0	30.7	......
Haul	100	303.5	100	1.0	2.9	1	3	9.8 tons	1.0	17.8	50.8

[a] The planting in this district was done on a contract basis; consequently the average crew size and labor requirements for this operation are not given.
[b] One acre abandoned after blocking and thinning.

TABLE XXII.—*Normal time, by operations, in producing sugar beets—Garland and Tremonton districts, Utah (1918).*

Operation.	Per cent age of total records.	Total acres covered.	Per centage of total acreage covered.	Average crew.		Most common crew.		Rate per day.	Times over.	Average hours per acre.	
				Man.	Horse.	Man.	Horse.			Man.	Horse.
Manure	91	317.5	41	1.6	2.8	1	2	13.3 loads	1.0	17.3	34.7
Plow	98	739	96	1.0	3.4	1	3	1.95 acres	1.03	5.5	18.3
Crown alfalfa	10	35	5	1.0	3.2	1	3	1.25 acres	1.0	7.8	23.7
Harrow (spike)	100	769	100	1.0	3.5	1	4	13.2 acres	3.2	2.5	8.2
Level	100	770	100	1.0	3.7	1	4	10.1 acres	2.0	1.9	7.0
Harrow (spring)	50	316	41	1.1	3.7	1	4	7.5 acres	1.6	2.1	7.1
Disk (one-half lap)	3	16	2	1.0	4.0	1	4	5.5 acres	2.5	4.0	16.0
Disk (no lap)	17	108.5	14	1.0	4.0	1	4	9 acres	1.8	2.1	8.4
Float	3	30.5	4	1.0	3.0	1	3	10 acres	1.0	.8	2.4
Roll	12	105	14	1.0	2.3	1	2	12.8 acres	1.1	1.0	2.2
Drag	2	8	1	1.0	4.0	1	4	8 acres	1.0	1.2	4.8
Plant	100	772	100	......	......	......	......	......	1.1	([a])	([a])
Roll after plant	76	538.5	70	1.0	2.0	1	2	12.5 acres	1.1	.9	1.8
Cultivate	95	740	96	1.0	1.9	1	2	9.2 acres	4.6	5.1	9.8
Ditch	86	700	91	1.4	2.2	1	2	20 acres	1.2	.7	1.2
Ditch (man labor)	83	623	81	1.1	......	1	......	9.8 acres	1.9	2.0	......
Furrow	95	740	96	1.0	2.0	1	2	10.3 acres	1.7	1.7	3.4
Irrigate	100	772	100	1.0	......	......	......	8.8 acres	4.6	8.8	......
Irrigate (replant)	3	32	4								
Replant [b]	7	42	5	1.0	2.0	1	2	7.7 acres	......	1.0	2.0
Block and thin	100	768	100	1.0	......	......	......	.5 acres	1.0	23.0	......
Hoe	100	[c]768	100	1.1	......	......	......	1.3 acres 1.7 acres 2.8 acres	2.3	18.3	......
Pull weeds	17	126.5	16	1.0	......	......	......	2.1 acres	1.3	6.8	......
Lift	100	766	100	1.0	3.2	1	3	2 acres	1.0	5.1	16.0
Top and load	100	766	100	1.2	......	......	......	5.7 tons	1.0	30.8	......
Top, machine	2	19	2	1.0	2.0	......	......	2.5 acres	1.0	4.0	8.0
Haul	100	766	100	1.0	3.7	1	4	12.3 tons	......	14.6	51.8

[a] The planting in this district was done by contract; consequently the average crew size and labor requirements for this operation are not given.
[b] Only replanting done by direct labor.
[c] Two acres abandoned after hoeing.

TABLE XXIII.—*Normal time, by operations, in producing sugar beets—Idaho Falls and Blackfoot districts, Idaho (1918).*

Operation.	Per cent age of total records.	Total acres covered.	Per centage of total acreage covered.	Average crew		Most common crew.		Rate per day.	Times over.	Average hours per acre.	
				Man.	Horse.	Man.	Horse.			Man.	Horse.
Remove and burn trash	7	35	4	1.0	2.0	1	2	15 acres	1.0	1.1	2.2
Do.[a]	3	21	2	1.0	......	1	......	......	1.0	.5	......
Manure	95	600	62	1.6	2.7	1	2	15.1 loads	1.0	14.9	26.1
Plow	96	931.05	96	1.0	3.2	1	3	2.1 acres	1.0	4.9	15.2
Crown alfalfa	1	10	1	1.0	3.0	1	3	2 acres	1.0	5.0	15.0
Harrow (spike)	99	957.3	99	1.0	3.1	1	3	13.7 acres	3.88	2.8	8.8
Level	89	838.05	87	1.0	3.5	1	4	10.8 acres	1.67	1.7	5.7
Harrow (spring)	20	110.25	11	1.0	3.5	1	4	6.4 acres	1.64	2.4	8.4
Disk (one-halflap)	4	15.5	2	1.0	3.0	......	......	4 acres	1.33	3.0	8.1
Disk (no lap)	8	56	6	1.0	3.7	1	4	6.5 acres	2.0	2.9	10.7
Float	32	301	31	1.0	3.0	1	3	11.75 acres.	1.60	1.3	4.0
Roll	38	429	44	1.0	2.2	1	2	14.5 acres	1.07	.8	1.7
Plant	100	967.3	100	1.0	2.0	1	2	10.4 acres	1.1	1.1	2.2
Harrow after plant.	1	1.5	(b)	1.0	3.0	1	3	3 acres	2.0	6.7	20.1
Roll after plant	39	308.3	32	1.0	2.0	1	2	14.6 acres	1.07	.8	1.6
Cultivate	100	892.3	100	1.0	1.9	1	2	8.7 acres	4.46	5.7	10.7
Ditch	47	514.5	53	1.7	2.5	2	2	......	1.0	.9	1.4
Ditch (man only)	92	883.3	91	1.1	......	1	......	......	1.29	1.6	......
Furrow	100	892.3	100	1.0	1.9	1	2	9.8 acres	1.64	1.9	3.5
Irrigate	100	892.3	100	1.0	......	......	......	7.5 acres	5.01	12.6	......
Block and thin	100	[c]898.3	100	1.3	......	......	......	.67 acres	1.0	21.9	......
Hoe	100	898.3	100	1.4	......	......	......	2 acres 2.3 acres 4.1 acres	2.1	16.9	......
Pull weeds	7	66	8	1.0	......	......	......	1.5 acres	1.25	7.4	......
Lift	100	892.3	100	1.0	2.8	1	3	2.2 acres	......	4.6	12.9
Top and load	100	892.3	100	1.8	......	......	......	7.8 tons	......	28.4	......
Haul	100	892.3	100	1.0	3.3	1	4	11.7 tons	......	10.8	34.5

[a] Man hours only. [b] Less than 1 per cent. [c] Six acres abandoned after blocking, thinning, and hoeing.

TABLE XXIV.—*Normal time, by operations, in producing sugar beets—Twin Falls district, Idaho (1919).*

Operation.	Per centage of total records.	Total acres covered.	Percentage of total acreage covered.	Average crew.		Most common crew.		Rate per day.	Times over.	Hours per acre.	
				Man.	Horse.	Man.	Horse.			Man.	Horse.
Remove trash	7	13.5	2	1.0	2.0	1	2	......	1.0	0.8	1.6
Manure	48	276.7	40	1.4	2.5	1	2	12.8 loads	1.0	14.4	27.3
Plow	95	661.03	96	1.0	3.4	1	3	2.1 acres	1.05	5.2	17.0
Crown alfalfa	23	133.75	19	1.0	3.8	1	4	2.6 acres	1.0	3.8	14.3
Harrow (spike)	98	682.03	99	1.0	3.2	1	3	15.6 acres	3.40	2.3	7.2
Level	80	516.03	75	1.0	3.3	1	4	8.4 acres	2.02	2.6	8.1
Harrow (spring)	48	365.75	53	1.0	3.3	1	3	8.6 acres	2.07	2.4	8.2
Disk	43	356.2	52	1.0	3.3	1	3	7.9 acres	2.32	3.8	10.8
Float	32	309.75	45	1.0	3.2	1	4	12.8 acres	1.86	1.6	5.5
Roll before plant	75	534.20	78	1.0	2.1	1	2	10.5 acres	1.09	1.1	2.2
Plant	100	687.03	100	1.0	2.0	1	2	8.6 acres	1.10	1.3	2.6
Harrow after plant	2	16.25	2	1.0	2.0	1	2	......	3.0	2.8	5.6
Roll after plant	36	275.25	40	1.0	2.1	1	2	11.6 acres	1.31	1.1	2.3
Plank	5	12.5	2	1.0	2.0	1	2	15 acres	1.50	.9	1.8
Cultivate	100	687.03	100	1.1	1.9	1	2	7.7 acres	4.42	6.9	12.3
Ditch (man and horse)	7	50	7	1.3	2.0	1	2	......	1.0	.5	.8
Ditch (man only)	86	641.28	93	1.0	......	1	......	4.8 acres	1.0	1.5	......
Furrow	100	687.03	100	1.0	1.9	1	2	8.3 acres	2.25	3.4	6.1
Irrigate	100	687.03	100	1.0	......	......	......	......	4.68	15.6	......
Block and thin	100	687.03	100	3.0	......	......	......	.9 acre	1.0	28.0	......
Hoe	98	687.03	100	1.7	......	......	......	1.8 acres 1.7 acres 2.3 acres	2.0	22.3	......
Lift	100	687.03	100	1.0	2.8	1	3	2.2 acres	......	4.6	12.7
Top and load	100	687.03	100	2.0	......	......	......	6.8 tons	......	21.9	......
Haul	100	687.03	100	1.0	3.0	1	2	13.1 tons	......	8.7	22.9

REMOVING AND BURNING TRASH.

In two districts a small amount of work was devoted to removal of trash following the harvest of the preceding crop. In the Idaho Falls area 4 per cent of the acreage planted to beets had trash removed from it; in the Twin Falls district, 2 per cent.

APPLICATION OF MANURE.

Farm manure was applied to 65 per cent of the total beet acreage of the farms visited in Lehi district, 62 per cent in the Idaho Falls area, and 40 per cent at Garland and at Twin Falls. In the Lehi area the manure was hauled almost exclusively with wagons and the application was made during the fall and winter months. The most common crew consisted of one man and two horses. In the Garland district slightly more than half of the men used manure spreaders and approximately two-thirds of the work was done during the fall and winter. There was considerable variation in the crew sizes in this district. Essentially the same methods were employed in the Idaho Falls and Twin Falls area, although the larger number of farmers made use of the manure spreader in the latter district.

As a rule beet growers can give very reliable estimates on the number of loads of manure applied per acre and the number of loads hauled per day. It is much more difficult to ascertain the number of tons applied per acre. Manure is never weighed, and as it varies somewhat in quality, as well as in the quantity of moisture that it contains, estimates on the per-ton application are likely to be exceedingly variable. In view of these facts it was felt that it would be best to report on the load basis. In the Lehi area the average application was given as 14.5 loads per acre. At Garland the average application was 12.5 loads, at Idaho Falls 13 loads, and at Twin Falls 12.2 loads per acre.

The man and horse labor requirements for manuring are influenced to some extent by the hauling distances, the size of the crew, and the condition of the field. In the Lehi district the labor requirement was comparatively high, because the average hauling distance was somewhat greater than in the other districts studied. Since many operators live in town and maintain some stock there, manure is frequently hauled from town to farm.

PLOWING.

The beet land is given only one plowing on the average farm, although two plowings are sometimes necessary.

In view of the fact that the sugar-beet crops followed alfalfa in three of these districts, a small amount of "crowning" was necessary. Crowning means breaking to a depth of 3 or 4 inches, which is sufficient to cut the crowns of the alfalfa plants. The tops are then allowed to dry out and the ground is replowed at a later date to a depth of 8 or 9 inches. Crowning alfalfa occurred on 8 per cent of the land planted to beets in the Garland area. Two and three-tenths per cent of the beet land was crowned at Idaho Falls, and as much as 22 per cent in the Twin Falls area, where the labor requirements for this operation were only slightly less than the labor for plowing. However, in the Garland district the reverse was the case.

Occasionally plowing is repeated in order to bring rough or uneven land into suitable condition for planting. Two plowings were necessary apparently in those cases where the ground was crowned and later given a deeper plowing in preparation for sugar beets. The work was divided quite largely between the autumn and spring seasons. The usual depth of plowing was approximately 9 to 10 inches.

There was considerable variation in the types of plows that were used. In the Lehi area the work was done mainly with sulky plows, the usual crew consisting of one man and three horses. Three types were used at Garland—namely, walking plows, sulky plows, and two-way plows. The most common crew was one man and three horses. The riding sulky plows were used quite extensively at Idaho Falls, whereas at Twin Falls two-way plows were used quite generally. The crew size was the same for both of the latter areas, consisting of one man and three horses. Plowing was done at an average rate of from 1.6 acres per day to 2.1 acres per day. The average rate for crowning was approximately 2.6 acres per day in the Twin Falls area. A day's work in all of these districts approximated nine and one-half hours.

The majority of the beet growers harrowed daily all of the land that was broken out that day. Fall-plowed land is liable to wind drift in this region. Many operators made a practice of harrowing up to the plow each half day, to prevent undue evaporation of moisture. This practice leaves the surface of the field in much better tilth, and subsequent culture can be carried out much more effectively than when the land is allowed to dry out before harrowing. The hot sun and rapid evaporation of moisture is likely to form hard clods if harrowing is not done soon after plowing.

In the preparation of land the disk harrow was used on relatively few farms in the Lehi, Garland, and Idaho Falls districts, but approximately 52 per cent of the area planted to beets in the Twin Falls district was disked. The operators on these farms went over the land an average of 2.3 times. On some farms it was customary to lap half when going over the field. Where this practice was common the two methods, single disk and lap half, have been separated, and the man and horse labor requirements are shown for each method. When the land is rough and cloddy after plowing and harrowing it can be pulverized and placed in condition much more readily with the disk harrow than with any other implement.

In the 1915–16 survey, just as in the current survey, comparatively few farmers gave estimates on disking.

LEVELING.

The leveler is almost indispensable on an irrigated farm. It is usually homemade, a frame of planks on edge, and the original cost should not exceed the actual cash outlay for the timber, bolts, and rods which are used in its construction. Although the primary object is to bring the surface to an even grade, more is accomplished than actually leveling the plowed soil. The leveler serves to break or crush many clods and also firms the seed bed. In this way leveling assists in securing the degree of pulverization essential in a good seed bed.

In the order of operations, leveling occupies an intermediate place between plowing and planting. Essentially the entire beet acreage was gone over with this implement. Exceptions may be found on farms in the Idaho Falls and Twin Falls districts. It will be noted, however, that floating the land was much more common in these two districts than at Lehi and Garland. The latter operation undoubtedly took the place of leveling.

The most common crew for leveling in the Lehi area consisted of one man and three horses. In the remaining districts the usual crew was one man and four horses. Leveling was done at the rate of 8 to 10 acres per day.

FLOATING.

The float is designed primarily to crush clods (fig. 7) and firm the ground, but it does not leave the land in as good condition for irrigation as does the leveler. It is constructed out of planks lapped one upon another, forming a stepped surface that comes in contact with the soil. The average width of this implement is approximately 8 feet. This homemade device is often attached to the rear of the harrow. Occasionally the same result may be obtained by affixing a single plank behind the harrow. The usual crew consisted of one man and three horses. Approximately 10 to 13 acres per day were covered with this implement.

HARROWING.

The toothed harrow is an important tillage implement on every farm. It is not only used extensively in the preparation of land which is to be seeded to grain, but it also plays a very important part in the development of a suitable seed bed for intertilled crops. Two types were found in these districts, namely, the common spike-tooth harrow and the spring-tooth harrow.

The usual crew size was one man and three horses, but Garland growers utilized a crew consisting of one man and four horses. Average "times over" ranged from 3.2 for Garland to 3.8 for Idaho Falls.

The spring-tooth harrow was used much less in all of these areas than the spike-tooth. The most common crew sizes were essentially the same as for the spike-tooth.

ROLLING.

Beet growers roll prior to planting for the purpose of creating a smooth, even surface for the drill. To get straight rows the driver must see the trail which has been left by the marker, and this line can be distinguished most readily on a newly rolled field. Furthermore, a firm and smooth seed bed is essential for planting at an even depth. Under certain conditions the roller may be operated for the purpose of breaking down a cloddy surface, or it may be utilized to break a crust after rain when the young plants are pushing through the surface. This operation is known as "rolling beets." Rolling the land before cultivation, especially before the blocking and thinning are done, facilitates the latter operation, and undoubtedly aids in removing many small obstructions, such as soil lumps, that may interfere with handwork. Rolling after thinning and before the next cultivation is sometimes done to prevent the covering of small beets

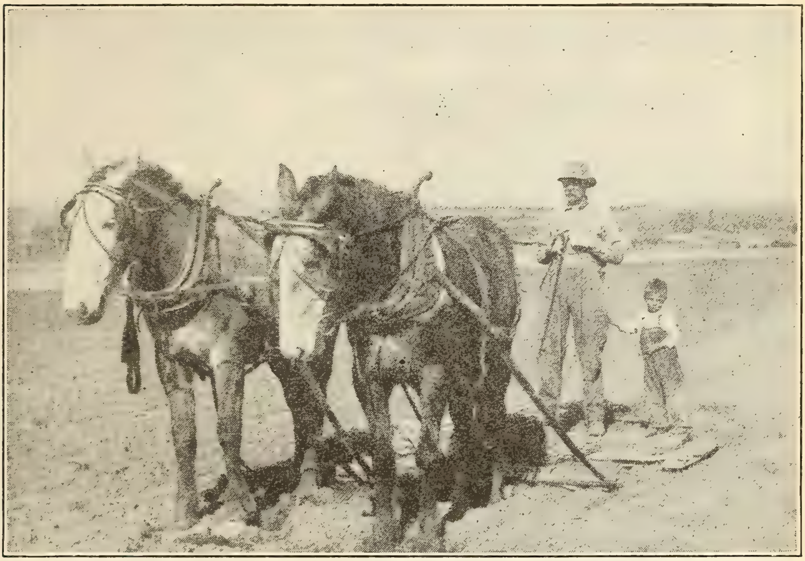

FIG. 7.—A float used on sandy soil for the purpose of breaking clods and creating a level surface ahead of the drill. Here the crew consists of one man and two horses, whereas the usual crew includes one man and three horses.

by loose dirt thrown in a ridge between the rows, especially where double-row thinning is practiced. These two operations are shown separately in the tables.

It will be seen that in the Lehi and Garland districts rolling after planting is much more important than rolling before planting. In the Idaho Falls area, where the soil type is lighter, about the same percentage of beet acreage was rolled before planting as after. In the Twin Falls area more rolling was done before planting than after. The most common crew for this operation consisted of one man and two horses. Rolling is usually done at the rate of 8 to 12 acres per day.

DITCHING.

A certain amount of ditching must be done annually on an irrigated farm. This may include work on the lateral which carries water from the main canal to the farm proper, or it may involve the removal of silt or other débris from the distributing lateral, or the building of temporary laterals. Whatever work is done should be divided equally among those enterprises with which the operation is directly chargeable. Sugar beets should bear a fair proportion of this cost.

This cleaning does not require much time; consequently, the total charge is small. In some cases the operation includes both man and horse labor. In others the work involves hand labor only. Frequently a plow may be used to advantage in removing the accumulated silt from the bottom of the lateral. A V-shaped machine is sometimes substituted for or used after the plow. The ditching is usually done immediately preceding a run of water.

In getting estimates on ditching practice only such work as the operator applied directly to the beet crop was entered in the record. These data were tabulated in two classes, the first comprising figures from those farms where man labor only was involved, the second figures from farms using both man and horse labor. Some growers did a part of the ditching with man and horse labor and completed the operation with hand labor only.

In the Lehi district ditching was done on 63 per cent of the acreage with man and horse labor. Man labor alone was applied to 97 per cent of the acreage. In the Garland district both classes of work apply to practically all of the beet acreage. In Idaho Falls 53 per cent of the acreage was included under ditching where man and horse labor were used, while 91 per cent of the acreage included man labor only. Man and horse labor for ditching in the Twin Falls district constituted a minor item.

PLANTING.

In the beet-growing districts of Utah it is customary for the factories to own and operate the beet drills. Ordinarily the planting is not done by the individual grower, but by some person employed by the sugar company to do this work on a number of farms within a given area. The men engaged for this purpose usually have small farms and are therefore in a position to do some outside work. There are several advantages in this arrangement. It is very evident that a man who operates a beet drill regularly can do a better grade of work than the man who plants a six or eight acre tract, which requires a fraction of a day, or at most not more than a full day, per year. Furthermore, the small farmer is not required to carry an investment in a piece of machinery which is used only for a few hours each year.

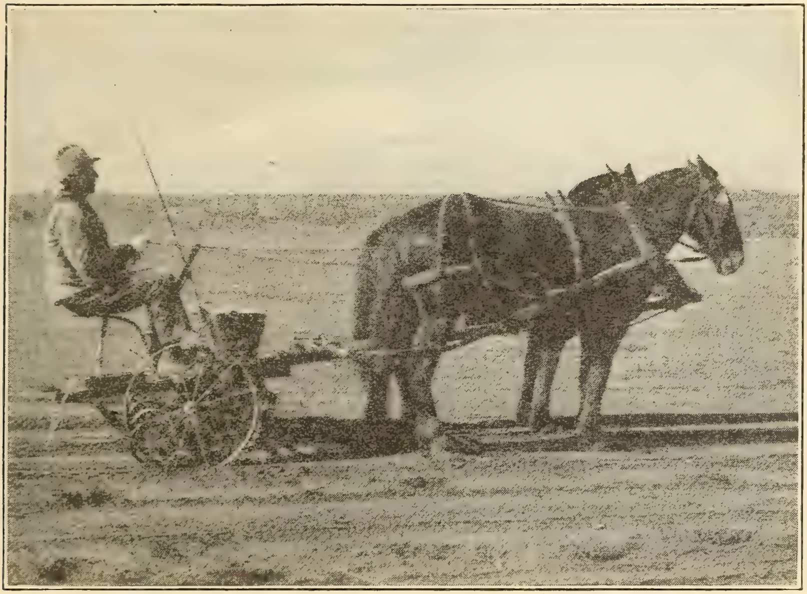
FIG. 8.—Putting in beet seed with a 4-row drill.

A direct charge of 50 cents per acre is made to cover the cost of planting. Beet seed is sold to the farmers at the rate of 15 cents per pound, and approximately 15 pounds are planted per acre. The farm operator hauls the seed from the factory or warehouse to the farm. This work is done at a season of the year when farm work is not pressing, or it is made a secondary feature of some special trip to town. The item of hauling seed is cared for under "overhead expense." In the Idaho district the farmers did their own planting. Beet seed is universally put in with a 4-row drill. It requires one man and two horses to do this work. (Fig. 8.) From 8 to 10 acres can be planted per day.

Frequently a portion of a stand may be lost and it becomes necessary to replant a part of the acreage. Replanting occurred on 54 acres in the Idaho Falls and Blackfoot area and on 48 acres in the Twin Falls area.

CULTIVATING.

Cultivation of sugar beets begins from two and one-half to three weeks after planting. The crop then receives attention at frequent intervals during the month of June and early in July. Cultivation usually ceases when the tops cover the space between the rows. Usually all of the cultivation is completed before irrigation, though under certain conditions there may be overlapping. Blocking and thinning proceeds simultaneously with the first cultivation. (See "Hand labor.")

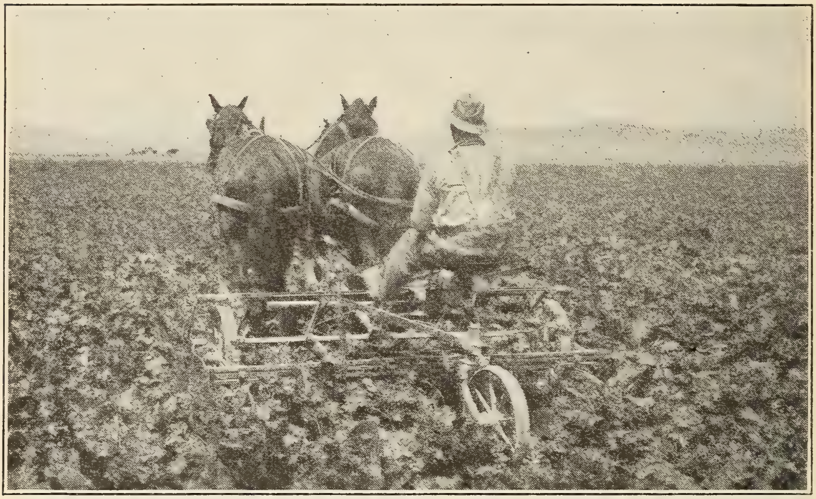

FIG. 9.—Cultivating sugar beets with a crew of one man and two horses. Four rows are handled by this cultivator.

In the Lehi district the cultivating was done almost entirely by a crew consisting of one man and one horse. On the average, beets were cultivated about five times. The most common crew in the three remaining areas consisted of one man and two horses. (Fig. 9.) In the Lehi district approximately 5 acres were cultivated per day, and in the other areas the average ground covered per day varied from 7.7 to 9.2 acres. The difference is reflected in the man-labor cost for cultivating and furrowing in the Lehi district. The 4-row cultivator, with its crew of one man and two horses, assists in reducing the number of man-hours expended per acre, and this, in turn, influences the total cost per acre.

OPENING FURROWS.

Furrowing is the opening up of furrows between the beet rows to make ready for irrigation. The furrowing is usually done after the last cultivation, with special attachments which are provided with each beet cultivator.

On many farms it is a custom to run the water in every other row space, alternating with each irrigation, and these are the rows which require special attention at the completion of the last cultivation. There are cases where water is run in every row space. As a rule, it is necessary to furrow out once for the purpose of making ditches and once to clean out and deepen them. The average number of times for furrowing approximated two in the Lehi and Garland areas, a little more than one and one-half times in the Idaho Falls area, and slightly more than two in the Twin Falls area. The crew sizes for furrowing and the rate per day correspond with the crews and rates for cultivation.

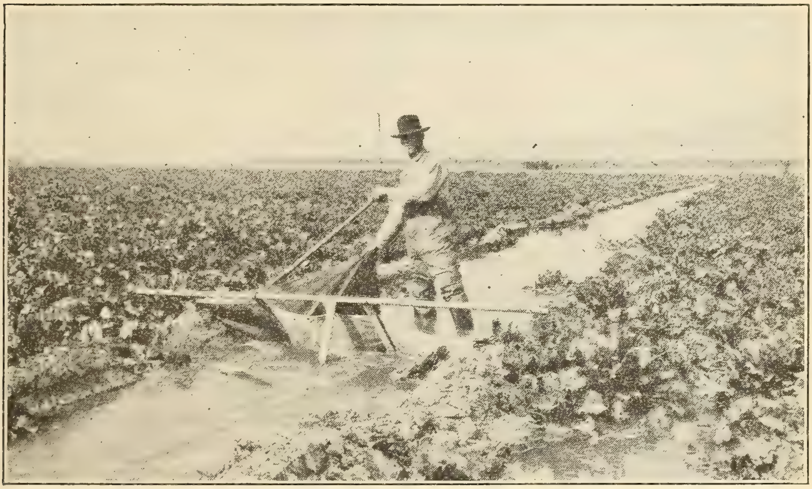

FIG. 10.—Removing a canvas dam in order to permit the head of water to find a new level.

IRRIGATION.

Irrigation requires man labor only. The making of ditches and cleaning of laterals require some horse labor, but this has been included under ditching. On most farms where sugar beets are grown, water is supplied by surface irrigation. There are a few farms that have subirrigation or seepage water that raises the water table in the soil high enough to supply the beet crop; but these fields are very rare and are not generally considered as areas producing normal sugar beet crops. Some men grow sugar beets with only one application of irrigation water, but this is usually done only where the available supply of water is low. Most lands in this region, to produce a normal yield of sugar beets, need two to four or more irrigations per growing season.

In the Lehi district 3 per cent of the acreage of sugar beets was not irrigated. In all of the other regions all of the acreage received one or more irrigations. Water was applied, on the average, six times per season on the Lehi fields, and about five times at Garland, Idaho Falls, and Twin Falls. (Fig. 10.) The irrigation season extended from May to the latter part of September. The available supply of water determines the number of irrigations applied in the latter part of the growing season, as most men believe that late irrigation increases the yields. When the soil is too dry at planting time, the growers either irrigate the land before planting or furrow irrigate immediately after planting. Then the crop is left as long as possible before irrigating the young beets, since a run of water interferes with cultivation and it is somewhat difficult to make furrows between the rows of small beets without covering some of the young plants. It is also generally assumed that, when young, the beets can stand more drouth without injury than they can later in the season. Where one has water available, the plants should not suffer for water at any time during the season. To obtain maximum yields it is essential that the beets use the entire growing season, and they can not make growth when suffering from lack of moisture.

The man-labor requirement varied somewhat for the different districts, owing to the difference in the acreage irrigated per day and the number of irrigations. The variation is greater between farms in the same region than between the district averages. There are many factors that influence the labor necessary for the irrigation of a given piece of land. The lay of the land and the head of water available are undoubtedly the most important of these factors.

BLOCKING AND THINNING.

Enough beet seed is usually drilled to give more plants than are required, provided a good germination is obtained. As soon as the plants are large enough so that the rows can be distinguished the blocking and thinning is done. Blocking, which means chopping out surplus plants with the hoe, leaves small clusters of beets ten to twelve inches apart in the row. Thinning, which is done by hand, takes out the surplus plants in each cluster. On a small farm the operator, with the assistance of members of the family, does part or all of this work.

In the Lehi area 90 per cent of this work was handled by the operator and his family. The rest represented contract labor for the handwork. In the Garland district 80 per cent was handled by the operator and his family. In the Twin Falls area essentially

85 per cent of the hand labor was done on a contract basis. At Idaho Falls 91 per cent was done by the operator and his family.

HOEING.

Hoeing is done during the early summer months. Under ordinary conditions the fields are hoed twice, but these records show three hoeings for the years 1918 and 1919. In cases where a contract is involved, the hand labor agrees to keep the field free from weeds; this may mean hoeing three times, together with some work in pulling out large weeds late in the season.

The stipulations of a typical agreement for contract labor for the year 1918 are given herewith:

> The grower, in consideration of the promises herein contained to be kept and performed by the said contractor, agrees to pay the contractor for said work as follows:
>
> | | |
> |---|---|
> | Thinning | $8.00 per acre |
> | First hoeing | 3.00 per acre |
> | Second hoeing | 2.00 per acre |
> | Pulling, topping, and loading—8-ton average crop or under | 12.00 per acre |
> | Pulling, topping, and loading—9-ton average crop | 13.00 per acre |
> | Pulling, topping, and loading—10-ton average crop | 14.00 per acre |
> | Pulling, topping, and loading—11-ton average crop | 15.00 per acre |
> | Pulling, topping, and loading—12-ton average crop | 16.00 per acre |
> | Pulling, topping, and loading—13-ton average crop | 17.00 per acre |
> | Pulling, topping, and loading—14-ton average crop | 18.00 per acre |
> | Pulling, topping, and loading—15-ton average crop | 19.00 per acre |
>
> In case the crop shall exceed 15 tons average per acre, the grower agrees to pay the contractor for harvesting such excess tonnage at the rate of $1 per ton.
>
> The contractor agrees that out of the money due for thinning the grower shall retain the sum of fifty (50) cents per acre, and out of the money due for first hoeing the sum of fifty (50) cents per acre, as guarantee for the proper completion of the later work. Upon the proper completion of the second hoeing and harvesting, this money shall be repaid to the contractor, without interest.
>
> The grower agrees to pay the contractor promptly upon the completion of each item of work, and, in case of delay in payments, the grower agrees to pay interest on all deferred payments from the time when due until paid at the rate of 1 per cent per month.
>
> * * * * * * *
>
> In the event that the grower shall elect to pull and top his beets with a mechanical device, he may be released from the further operation of this contract without prejudice, by notifying the contractor of his intention on or before September 1, 1919, and by paying to the contractor the $1 per acre retained under the above-mentioned arrangement, together with any money due the contractor.
>
> The contractor agrees, where possible, to space the beets from 9 to 14 inches apart in the row, thinning the plants so that not less than 90 per cent thereof shall be single plants at the time of thinning; to leave the plants in a healthy condition, not to expose the roots more than necessary; at thinning time to hoe deep enough to remove all weeds by the roots that are in the row or within three inches thereof on either side; to keep the beets free from weeds in the row by hoeing them at least twice after thinning; if so instructed by the agents of the sugar company, to pull all weeds

by hand at the time of the second hoeing, and to avoid filling up irrigation ditches or furrows where the tops are so large that it will be impossible to refurrow. The contractor agrees to perform said hoeings at the time and in the manner specified.

The contractor further agrees that, at the time of harvest, he will pull the beets by hand and strike them together as much as necessary to remove the dirt, and pile at least six rows of beets in one windrow; that under no condition will the contractor use a hook or any other sharp instrument for pulling the beets; that he will top the beets at the base or bottom leaf; that he will pile the beets upon clear ground free from leaves, weeds, trash, or clods, in piles of from 300 to 400 pounds each, and will load the same into the wagons free from leaves, weeds, trash, or clods of any kind, and as free from dirt as possible; that at the request and under the direction of the grower he will keep the beets thus piled covered with sufficient leaves to protect them thoroughly from frost and sun, it being understood that, if the grower wishes the beets covered with dirt, he will bear the expense thereof, and that the grower will also bear the expense of uncovering and loading all beets that may be covered with leaves or dirt.

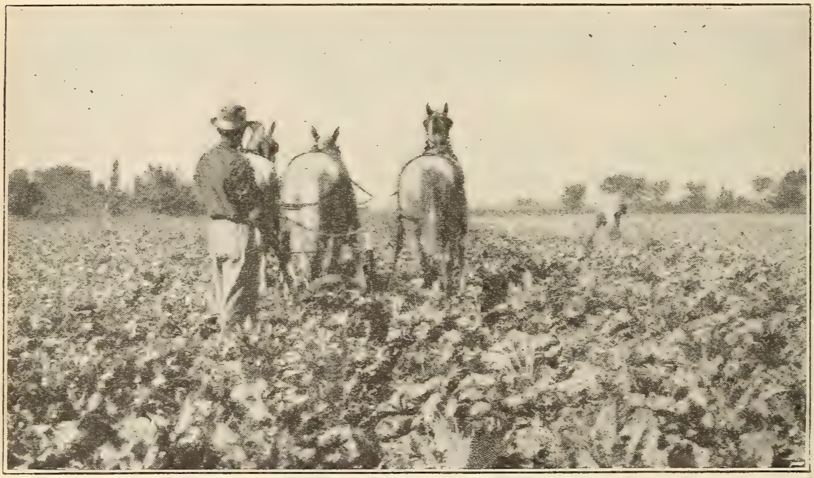

FIG. 11.—Lifting or pulling with a 1-man, 3-horse crew.

The contractor agrees to do all work specified herein promptly, regularly, in a workmanlike manner, and to the satisfaction of the representative of the sugar company.

In the event of the failure of the contractor properly to perform his work at the time and in the manner stipulated, the one dollar ($1) per acre withheld as aforesaid, or such part thereof as may be equitable and just, shall be forfeited to the grower as liquidated damages for such failure, provided, however, that the agricultural representative of the sugar company having charge of the said tract of land shall have exclusive power and authority to determine whether any such forfeiture shall be made and the extent thereof, notice of the decision to be communicated to the contractor in writing.

The grower agrees that he will properly prepare the land and plant the beets, and, as soon as the rows can be seen, will proceed with the cultivating, exercising care not to cover the beets, and so running the cultivator as to cut all the weeds between the rows; and in the event that other cultivation shall be necessary before thinning, that he will do the same as rapidly as possible so as to prevent delays in the thinning;

and, as soon as the beets have straightened up, that he will proceed to cultivate as often as may be required to remove the weeds between the rows without destroying any of the plants. The grower further agrees to plow up his beets as rapidly as the contractor is able to pull, top, and load the same and to furnish wagons promptly for hauling the same to the sugar company's receiving station.

The grower agrees to furnish the contractor with a camping place for the laborers necessary to perform the work herein provided for, together with hay or straw for their bedding and water and fuel for domestic purposes. In the event that the grower's fields shall be more than one mile from the camp established by the contractor, the grower agrees to haul all laborers necessary to perform the work hereinbefore provided for, to and from such fields. The grower further agrees to haul the laborers from the sugar factory or the railroad station to his farm and to return them at the completion of their work.

LIFTING, PULLING, AND TOPPING.

The harvest season begins late in September and frequently extends well into the month of November. As a rule enough lifting is done each day to furnish work for that day. The pulling is done by hand as described in the foregoing contract. The beets covered by this study were loosened entirely with a one-row lifter. (Figs. 11 and 12.) The most common crew for lifting consisted of one man and three horses. From one and one-half to two acres constitutes a day's work in lifting.

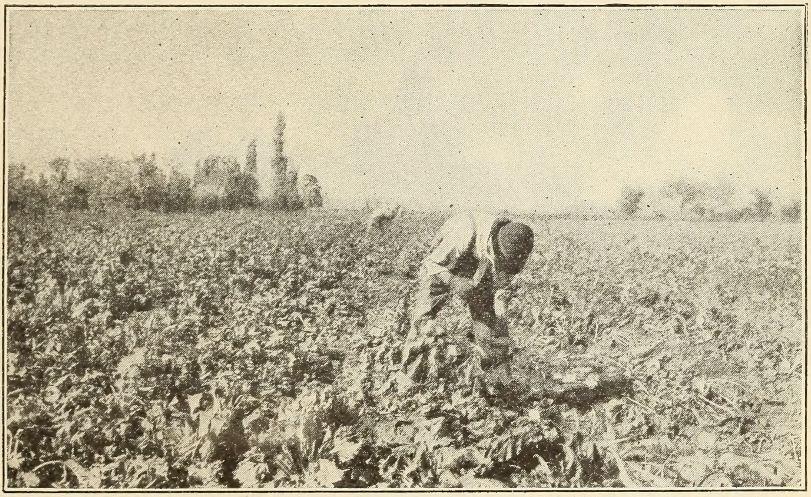

FIG. 12.—Topping sugar beets. Sometimes it is customary to pull and top from the loosened row, while in other cases the beets are thrown in piles and topping is done from the latter.

The handwork, pulling, and topping, has been described in the sample contract.

HAULING.

Hauling coincides with lifting. When the latter begins late in September or early in October the greater part of the work will be completed by the middle or toward the end of November. The sugar beet is a bulky and heavy product to handle; hence good wagons with substantial racks are an important part of the grower's equipment. Ample horsepower must be provided to haul the beets from the field to the dump, slicing station, or factory. (Fig. 13.) Formerly many of the sugar beets were unloaded by hand, but under present conditions part of this work is done mechanically. When the soil is soft, an extra team may be required to assist the regular crew.

The distance between the beet fields and the loading station naturally has considerable influence on the cost of delivery. If there is a long haul, the cost of hauling will be much greater than it is for the farm which has a near-by loading station. (Table XXV.)

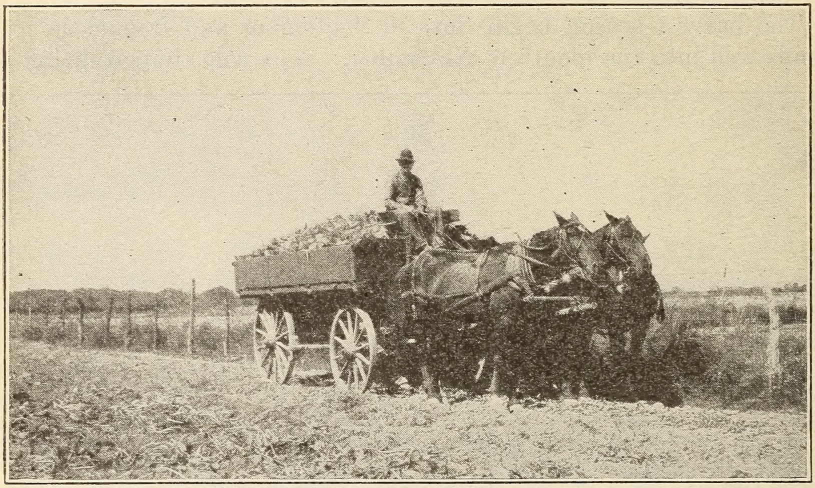

FIG. 13.—Hauling beets to sugar factory. This type of rack enables the grower to unload without any hand labor and with but little loss of time.

Comparing the group with an average hauling distance of less than one-half mile with the group with an average haul of over 3 miles, it will be seen that there is a difference of 5.5 man-hours and about 22 horse-hours in labor requirements for hauling.

TABLE XXV.—*Relation of distance from market to time required for hauling beets.*

Groups, by distance.	Average distance.	Percentage of records.	Average crew.		Hours per ton.		Hours per acre.	
			Man.	Horse.	Man.	Horse.	Man.	Horse.
Less than 1½ miles	0.9	57	1.0	3.3	0.7	2.4	10.09	33.62
1½ to 3 miles	2.3	31	1.0	3.2	.9	3.0	12.03	38.72
Over 3 miles	3.8	12	1.0	3.6	1.1	3.8	15.59	55.91

COMPARISON OF BEET RECEIPTS WITH OTHER FARM RECEIPTS.

A comparison of the returns from sugar beets with that from other farm enterprises brings out the importance of this crop in these districts. By referring to Table XXVI it will be seen that the per cent of farm receipts from sugar beets varied considerably on the 220 farms surveyed. In the Twin Falls area approximately 25 per cent of the farm receipts were from sugar beets, whereas in the Lehi and Garland districts approximately 50 per cent of the farm receipts came from the sale of sugar beets. The Idaho Falls farms fell between these extremes. In all cases the major portion of the farm incomes came from the sale of crops. The Idaho Falls and Twin Falls areas indicate returns from live stock and live-stock products ranging from 17 to 23 per cent.

In the Lehi and Garland districts about 63 per cent of the income from crops came from sugar beets. The percentage was somewhat lower in the Idaho Falls and Twin Falls areas. In the latter districts potatoes and wheat were important cash crops.

TABLE XXVI.—*Per cent of receipts from various sources.*

Region.	Percentage of farm receipts.					Percentage of crop receipts.	
	From beets.	From beet tops.	From all other crops.	From live stock and live-stock products.	From miscellaneous crops.	From beets.	From beet tops.
Garland, Utah	53.5	1.5	29.1	13.6	2.3	63.6	1.7
Lehi, Utah	48.2	1.9	27.1	17.5	5.3	62.4	2.4
Idaho Falls and Blackfoot, Idaho	34.3	1.2	40.4	23.2	.9	45.2	1.6
Twin Falls, Idaho	26.4	1.1	49.6	16.9	6.0	34.2	1.4

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